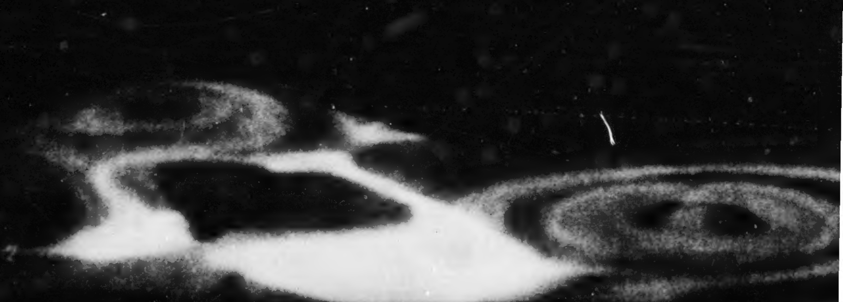
Report of the Commission of Inquiry

into matters relating to the safety
of the public drinking water in the
City of North Battleford, Saskatchewan

March 28, 2002



The Honourable Robert D. Laing, Commissioner

102-04382/

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CONTENTS

Preface 1

Acknowledgments 3

Introduction 4

Part I - Background Information 9

1. **The North Saskatchewan River** 9
2. ***Cryptosporidium parvum*** 14
3. **Guidelines, Standards and Permits** 20
   - (a) Canadian Drinking Water Quality Guidelines 20
   - (b) Industry Standards Since 1989 25
   - (c) The Saskatchewan Drinking Water Guidelines 27
   - (d) North Battleford's Permit to Operate a Waterworks 30
4. **The "Capable" Surface Water Treatment Plant** 34

Part II - The North Battleford Plants Department 43

1. **Sewage Treatment Plant** 44
2. **Water Distribution System** 57
3. **Ground Water Plant** 61
4. **Surface Water Plant** 64
   - (a) Physical Plant 64

(b) Operations 71

(c) Record Keeping 76

(d) Operator Training and Education 79

5. **Supervision and Management** 89

6. **Funding and Utility Rates** 110

7. **September 2000 Coliform Event** 112

Part III - The Battlefords Health District 120

1. **Protocols Applicable to Communicable Disease in the Province** 125

2. **Protocols for Water-borne Pathogens** 127

Part IV - The *Cryptosporidium parvum* Outbreak April, 2001 131

1. **Investigation** 131

2. **Physical Cause of the *Cryptosporidium parvum* Outbreak**

(a) The Solids Contact Unit 146

(b) *Cryptosporidium parvum* Testing 150

(c) Sewage Effluent – DNA Analysis 151

(d) Epidemiological Study 152

(e) Laboratory Investigations 158

(f) Cause 159

Part V - Response to the Outbreak....160

1. **SERM-Health's Protocol for Removing the Boil Water Order and the City of North Battleford's Response**....160
    - (a) Adequacy of the City's Response....173
    - (b) Adequacy of SERM's Response....181
2. **Response by the Battlefords Health District**....185
    - (a) Role as Investigator....185
    - (b) Public Communication....190
    - (c) Communicable Disease Administration....194

Part VI - Policies, Guidelines, Procedures and Practices Related to Drinking Water Prior to April, 2001....196

1. **The City of North Battleford**....196
2. **The Battlefords Health District**....199
    - (a) Water Compliance Activities....199
    - (b) Communicable Disease Investigation....202
3. **Department of Saskatchewan Environment and Resource Management**....204
    - (a) Responsibility for the Regulation of Drinking Water....204
    - (b) Reduced Budget Choices....207
    - (c) Organization....219
    - (d) Inspection Program....224

(e) SERM's Knowledge of the Safety of Drinking Water 227

(f) Cabinet Decision Item (CDI) 237

(g) Bacteriological Response Protocol 253

(h) Operator Training 262

  (i) Voluntary Program 262

  (ii) Communication Policy with Operators 267

  (iii) Mandatory Certification 269

(i) Adequacy of the Policies, Practices, and Guidelines of SERM and the Governmentof Saskatchewan 276

Part VII - Regulatory Reform 281

Part VIII - Summary of Findings 292

Part IX - Summary of Recommendations 302

Appendices 310

A. Process of the Inquiry 310

1. General 310

2. Mandate 310

3. Practice and Procedure 310

4. Standing 311

5. Consequences of Standing 312

6. Funding 313

7. The Collection of Evidence 314

8. The Hearings...316

9. Closing Arguments 317

B. Boil Water Order - April 26, 2001 318

C. Protocol for Removing Boil Water Order..................................320

D. Confidential Notification of Enteric Diseases Form 325

E. Precautionary Drinking Water Advisory - April 25, 2001 ...326

F. Water Management Framework 330

G. Summary of Problem Identification, Cabinet Decision Item - November 20, 2000..........................334

H. *The Public Inquiries Act* 336

I. Order-In-Council - May 10, 2001 337

J. Rules of Procedure and Practice...340

K. Funding 346

L. Notice of Hearing...349

M. Ruling on Standing and Funding..351

N. Appearances of Counsel 359

O. Witness List 360

P. Briefs Received 364

Q. Undertaking of Counsel...365

R. Supplementary Undertaking of Counsel 366

S. Undertaking of Counsel Regarding Documents 367

T. Certification of Production of Documents 368

U. Evidence Agreement 369

V. Ruling on Final Submissions 371

Figures

1. North Saskatchewan River Daily High Turbitdity (NTU) Measured at Rossdale Water Treatment Plant (January to December 2000) 10

2. North Saskatchewan River Cryptosporidium Concentrations (1992 to 2001) 11

3. Parameters Under Review or Scheduled for Review 23

4. North Saskatchewan River Showing Findlayson Island 54

5. City of North Battleford Water Distribution System 57

6. City of North Battleford Historical Water Production by Volume 59

7. City of North Battleford Water Production and Water Rates (1989 to 2001) 62

8. City of North Battleford Water Treatment Plant Number 2 Process Schematic 64

9. City of Prince Albert Alum Dosage Rate 74

10. Health Districts Map Saskatchewan 121

11. Strength of Association of Outbreak to Water 129

12. City of North Battleford Water Treatment Plant Number 2 148

13. Comparison of Water Quality Data with Disease Burden Data 156

14. Saskatchewan Environment and Resource Management Drinking Water Compliance Report Summary: Compliance with Sample Requirements 1994/95, 1999/00, 2000/01 235

15. Saskatchewan Environment and Resource Management Drinking Water Compliance Report Summary: Turbidity, Free Chlorine, Total Chlorine, Microbiological (Regular Samples) 1994/95, 1999/00, 2000/01 236

16. Community Waterworks 242

17. Summary of Actions to be taken by Environmental Protection Branch, EcoRegion, Sask Health / Provincial Laboratory and Health Districts 255

PREFACE

By Order-in-Council dated May 10, 2001, the Government of Saskatchewan ordered this Commission of Inquiry to report and make findings and recommendations with respect to any and all aspects of the following matters:

(a) the circumstances that led to the current contamination of the public water supply of the City of North Battleford;

(b) the adequacy and effectiveness of the actions taken by officials of the Government of Saskatchewan, The Battlefords District Health Board, and the City of North Battleford leading up to and in response to the discovery of the contamination of the public water supply in the City of North Battleford;

(c) the effect, if any, of the regulations, by-laws, policies, guidelines, procedures, and practices of or applicable to the Government of Saskatchewan, the Battlefords District Health Board and the City of North Battleford on the events referred to in (a) and (b);

(d) any other relevant matters that the Commission considers necessary to determine that the City of North Battleford's public drinking water is safe in the future.

The Commission was directed to perform its duties without expressing any legal conclusion or recommendation regarding the civil or criminal responsibility of any person or organization.

As will be observed from the terms of reference, the focus of the inquiry is the City of North Battleford, Saskatchewan, as opposed to the state of drinking water in the Province of Saskatchewan. As it turned out, this focus was easy to maintain until it was necessary to address the effect of the regulations, by-laws, policies, guidelines, etc. of the Government of Saskatchewan. Government regulations and policies are not formulated for one city, but rather for the province as a whole

Preface

When it came time to introduce evidence on the policies of the department of Saskatchewan Environment and Resource Management (SERM), and their history, it was not possible to do this without incidentally also placing in evidence how the exercise of SERM's regulatory mandate was implemented provincially. The evidence of how SERM arrived at its policies incidentally disclosed SERM's knowledge of the state of drinking water quality in the province. The evidence showed there are more problems with water quality in smaller communities in Saskatchewan than in larger urban centres, such as North Battleford. The question arose as to how much of this information should be included in the report.

I elected to include the evidence obtained from SERM and the Government of Saskatchewan with respect to its knowledge of the state of drinking water quality in the province. This evidence is not directly relevant to the terms of reference, but indirectly it is not possible to talk about regulatory reform without considering the state of the industry to be regulated. Also, the terms of reference include "any other relevant matters that the commission considers necessary to determine that the City of North Battleford's public drinking water is safe in the future." Once I concluded that among the ways this might be accomplished was to have the regulator play a greater supervisory role than it had in the past, and that the regulator should take the lead role in source water protection, it did not make sense to try and justify the recommendations on the basis of North Battleford alone, when the evidence of the state of quality of drinking water in other communities was also available. It also did not seem fair to propose regulatory reform for North Battleford, and leave the wrong impression that it was the only community in the province that had recently experienced water quality problems.

I concluded an explanatory note was required for why some of the broader evidence in the report was included, and I elected to do so here, at the outset, rather than within the body of the report.

March 28, 2002

ACKNOWLEDGMENTS

I would like to express my deep appreciation to Mr. James Russell, commission counsel, who kindly agreed to accept my request to act in this respect, while knowing that the summer of 2001 would pass him by. From the outset, we realized our timetable was tight and, with a reporting date of March 31, 2002, it was decided we should attempt to have the hearings concluded by year end, 2001. That this occurred is due solely to his efforts. He worked tirelessly from May 15, 2001, to September 15, 2001, when hearings commenced, and thereafter. Mr. Russell performed his role as counsel with great skill and energy that won not only my appreciation, but the appreciation of counsel for all of the parties, many of whom made a point of telling me so. I would also like to express my appreciation to assistant counsel, Mr. Christopher Boychuk and Mr. Blair Bleakney, who ably assisted Mr. Russell and approached all of their work with a competent enthusiasm. Together with Mr. Russell, they made a great team.

As other commissioners have noted, outside of the choice of commission counsel, the next most important role to fill in connection with a commission of inquiry is the executive officer who will be in charge of all non-legal matters. I was very fortunate that Mr. Warren Bickford, the Director of Communications for Saskatchewan Justice, at my request, agreed to take the job, with the approval of his Deputy Minister, after it became apparent I was not having much luck finding such a person on my own. I had discovered that persons who are semi-retired, or retired, are so for a reason that does not include a desire to work 12 hours a day for most of a nine-month period. Mr. Bickford applied his considerable administrative and communications skills to the fullest, with the result that everything that was supposed to happen did happen, and on time. I am grateful to him for his important contribution to the work of the inquiry.

Mr. Norman Doell, our registrar, did an excellent job of keeping track of witnesses and exhibits and assisted in many other ways.

Finally, I wish to thank Associate Chief Justice Dennis O'Connor, Commissioner of the Walkerton inquiry, for devoting a day of his busy time to providing me and Mr. Russell the benefit of his experience as commissioner, and to making available members of his staff who did likewise. The advice and assistance we received was of immense help in allowing us to get underway with this inquiry sooner than might have otherwise been the case, and with fewer pitfalls along the way.

INTRODUCTION

The City of North Battleford is located on the North Saskatchewan River and has a population of approximately 15,000 persons. It operates two water treatment plants – a ground water plant that relies on wells as the source of the water processed through it, and a surface water plant that draws water from the North Saskatchewan River. It is this latter plant that was the focus of much of the evidence led at the inquiry. Located 3,500 metres upstream from the surface water plant's water intake pipe is the City of North Battleford's sewage treatment plant.

The inquiry was ordered following an outbreak of gastrointestinal illness in North Battleford in the months of March and April, 2001. On April 25, 2001, as a result of this outbreak, Saskatchewan Environment and Resource Management (SERM), in consultation with the Battlefords Health District and the City of North Battleford (City), issued a precautionary drinking water advisory (PDWA) to the citizens of the area. The next day, on April 26, 2001, the advisory was upgraded by the Battlefords Health District, as a result of additional cases of cryptosporidiosis reported, to a boil water order. This order remained in place until July 25, 2001.

An epidemiological study conducted by Health Canada at the request of the Province of Saskatchewan, commenced April 27, 2001, and concluded that an estimated 5,800 to 7,100 people from the Battlefords area, along with hundreds more from other communities and other provinces, were affected by the outbreak.

For reasons set out later in the report, the gastroenteric outbreak was caused by the parasite *Cryptosporidium parvum*. The parasite entered the treated water distribution system through the surface water treatment plant that obtains its raw water from the North Saskatchewan River. There have been a number of outbreaks of cryptosporidiosis in North America in recent years, the most notable of which occurred in Milwaukee, Wisconsin, in 1993 when 400,000 persons became infected and 100 persons died as a result. *Cryptosporidium parvum* is ubiquitous in surface waters as opposed to ground water and has been described as an emerging pathogen. In the last ten years, the surface water treatment industry has focussed attention on steps that might be taken to eliminate or inactivate this parasite in treated drinking water.

What the experts and the industry recommend with respect to the treatment of all surface water is a multi-barrier approach. The first barrier is watershed protection to ensure the best possible raw water source. The next barrier is optimization of the plant processes designed to achieve settlement of particulates and sediment in the raw water. The third barrier is maximization of the efficiency and monitoring of the filtration process which follows sedimentation. The final barrier is to ensure the water is adequately disinfected. None of the foregoing barriers were maximized at the North Battleford surface water treatment plant in the years leading up to the outbreak.

What emerged in the course of the inquiry is that accepted industry standards and practices for the treatment of surface water are far more specific and demanding than what was specifically identified in government regulations and guidelines, or in North Battleford's permit to operate a surface water treatment plant. It also emerged that the administration of the City of North Battleford and its operators of the plants were largely unaware of developments in the surface water treatment industry in the past ten years.

The provincial regulator, SERM, had abandoned its inspection program of surface water treatment plants in 1993 in favour of a risk-based model, based on bacteriological monitoring only, of those municipalities who chose to submit bacteriological samples. The last time the North Battleford surface water treatment plant had been inspected prior to April, 2001, was in the year 1991. Evidence tendered at the inquiry incidentally disclosed water quality problems in many smaller communities, apart from the relatively large community of North Battleford. That the problems disclosed with respect to surface water treatment in North Battleford are not unique to that city has been kept in mind in the writing of this report.

The report attempts to fulfill the mandate of the Commission by presenting the facts in the form of a case study. To the extent the mandate directs inquiry into the circumstances that led to the contamination event in North Battleford, a broad definition of the word "circumstances" has been adopted to include background conditions, as well as the more immediate events which contributed to the *Cryptosporidium parvum* outbreak. "Circumstance" is not a synonym for cause in the legal sense, but rather has a meaning closer to "relevant fact." For example, the North Saskatchewan River, which is the North Battleford surface water plant's source of raw water, is also the source of *Cryptosporidium parvum* which ended up in the treated water. The river is not a cause of the outbreak in any legal sense, but its qualities are a relevant fact or circumstance in what eventually transpired.

Part I of the report provides background information that is somewhat detailed in the hope that it will be of use to other operators of surface water treatment plants in the province who are lacking background and knowledge of the surface water treatment processes and the risks associated therewith.

Part II deals with the city's plants department and may be of interest to municipal administrators and elected officials who have responsibility to produce safe drinking water and wish to learn from the North Battleford experience. The report concludes that the city lacked an appreciation that safe drinking water is a public health priority that distinguishes the water utility from other public works administered by the city. The result of this lack of appreciation is that North Battleford's surface water plant and the operations carried on therein were substandard by industry standards in April, 2001. The report attempts to make the point that the goal of producing safe drinking water cannot be accomplished solely through better infrastructure. A commitment to excellence in operations is also required from civic administrators and politicians. This in turn requires the establishment of policies that commit to producing the safest drinking water possible.

Part III outlines the role of the Battlefords Health District with respect to communicable disease and, in particular, communicable enteric diseases, and reviews the protocols in place in this respect. The protocols were generic and not specific to the investigation of water-borne pathogens. This section reviews the merits of protocols that are specific to water-borne pathogens and recommends the province develop such a protocol for distribution to all health districts.

Part IV, which addresses the *Cryptosporidium parvum* outbreak, points out how difficult it can be to recognize a water-borne pathogen enteric disease outbreak in its early stages. It also points out the importance of having a protocol in place that will activate a team of stakeholders to investigate whenever an enteric disease outbreak could be caused by a water-borne pathogen. The report concludes that while the investigation conducted by the Battlefords Health District left room for improvement, this was not a material factor in the number of persons who experienced enteric disease in the community.

Part V of the report deals with the response to the outbreak by the city, the Health District, and SERM. It reviews the protocol that was in place to implement the boil water order and how it worked on this occasion, which was reasonably well. It also reviews the protocol that was put in place by SERM for the removal of the boil water order. Since then the city has, under the guidance of a consultant, improved the technology available in the surface water plant and has adopted a quality control/quality assurance program that was absent prior to April, 2001.

Part VI of the report reviews the policies of the city, SERM, and the Health District that were in place in April of 2001, and reviews the effect of such policies on the event which occurred. As noted above, the report concludes that the city did not have a policy with respect to the safety of drinking water. It concludes that SERM was an inadequate and ineffective regulator of drinking water as a result of its policy to gradually withdraw from active regulation in 1997.

Part VII of the report addresses the need for regulatory reform in the province, directed at providing a level of supervision of water treatment facilities that will provide a greater assurance to members of the public that the municipal water treatment facilities in North Battleford, and elsewhere, are capable of producing safe water.

The report concludes that it should be the role of the regulator to set standards for performance by water treatment plants, as opposed to relying on guidelines, and that the best place to set the standards is in the permit to operate the water treatment plant. It is recommended that the regulator go beyond the setting of water quality parameters and a schedule for sampling when issuing a permit, and also include operational standards that conform with accepted industry practices. The report recommends a comprehensive inspection program and a rigorous abatement-enforcement compliance program.

The report notes that water treatment is a specialized business requiring specialized management and specialized supervision. Larger water treatment facilities such as those located in the cities of Saskatoon and Regina can operate their own compliance departments within the utility. In the case of smaller communities, in-house compliance monitoring is neither practical nor affordable. In such cases, including communities the size of North Battleford, the necessary compliance oversight can only be achieved through a provincial regulator.

The report recommends the return to a free-standing drinking water quality unit inside SERM, with its own director, its own budget, and a staff that reports centrally to it. It is recommended that this unit be given responsibility for watershed and ground water source protection in addition to the proposals in the foregoing.

Finally, the report recommends the proposed water quality unit report annually to the legislature on the state of drinking water quality in the province. This is recommended as a method of heightening the profile of the topic of drinking water amongst legislators, and also of acting as a report card on the work of the proposed drinking water quality unit.

The findings outlined at the end of a number of sections of the report are conclusions arrived at on the basis of the evidence considered necessary to support the recommendations for change or action advocated in the report. There was very little factual dispute in the evidence presented at the inquiry. The debate, in the end, was what interpretation should be placed on the facts that were otherwise uncontroverted.

As commission counsel stated at one point in the hearings, there were no villains in this story. There was simply a great deal of indifference to the public health safety aspects of drinking water, on the part of the city who had the responsibility to produce potable water, and on the part of SERM who had the mandate to regulate it.

PART I – BACKGROUND INFORMATION

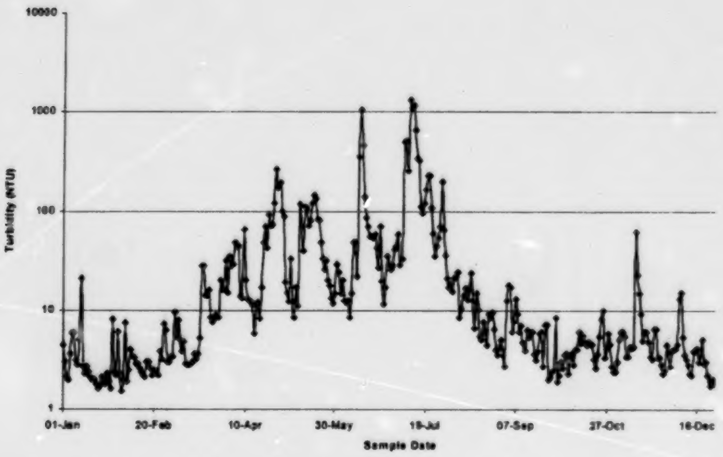
1. The North Saskatchewan River

The North Saskatchewan is a major river with headwaters in Alberta's Rocky Mountains. West of Edmonton the river is controlled by reservoirs that moderate its rate of flow. Saskatchewan is guaranteed a certain percentage of flow under the Prairie Provinces Water Board Agreement.

A major characteristic of the river is that it has peak flows in the summertime months of June and July as a result of snow melt in the mountains, and heavy precipitation events that increase runoff in the river's large watershed. Evidence at this inquiry suggests base flows of the North Saskatchewan River are 100 cubic metres per second but can go up to 800 cubic metres per second, or higher.

A corollary characteristic of the river is that it becomes very turbid on occasion, and its turbidity can increase very rapidly in a very short period of time. Turbidity is a measurement of the clarity of the water. In the winter months turbidity levels are low because the rate of flow of the river is low and it is ice covered. During the rest of the year runoff from agricultural or urban sources carries erosion products into the river. During extreme flow events, the flow may be sufficient to re-suspend some of the material that has settled on the river bottom. Thus, the sediment load that the river carries varies throughout the year. One of the operators who testified at this inquiry indicated he had seen river turbidities as low as 2 nephelometric turbidity units (NTU) and as high as 1,700 NTU. Dr. Stephen Stanley is general manager of operations for EPCOR Water Services Inc. (EPCOR), which supplies water to the City of Edmonton and surrounding communities, and provides operation and maintenance services to a number of other communities in Alberta and British Columbia. He has sufficient concern with the quality of the water in the North Saskatchewan River that his company has protocols in place if the turbidity of the treated water exceeds a certain level, one well below the level mandated by regulation.

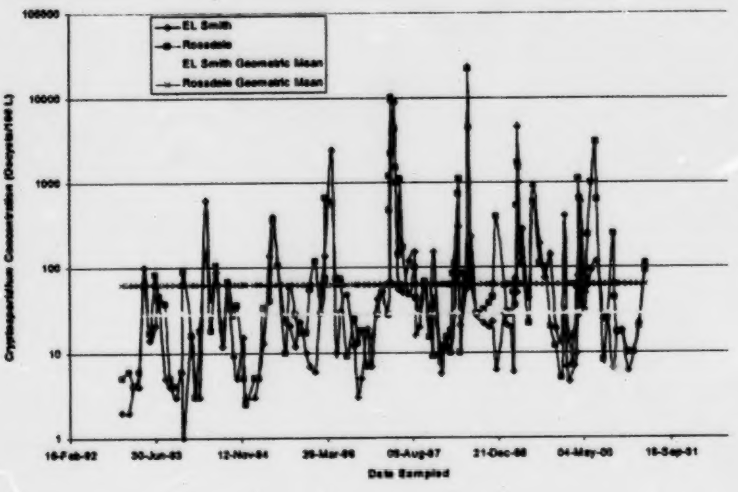
Fig. 1
NORTH SASKATCHEWAN RIVER DAILY HIGH TURBIDITY (NTU) MEASURED AT ROSSDALE WATER TREATMENT PLANT (JANUARY TO DECEMBER 2000)



Source: Dr. Steven Stanley Assessment Report
EPCOR water Services, Inc.
Exhibit C-88

The North Saskatchewan River is a relatively high risk source water for parasites. This statement is based on testing performed by EPCOR in Edmonton. It is recognized that water is one of the main modes of transmission of pathogens, which include parasites such as *Cryptosporidium parvum* and *Giardia lamblia*, both of which can cause enteric disease. The river has considerable agricultural activity within its watershed. Livestock have been shown to be a significant source of *Giardia lamblia* and *Cryptosporidium parvum*. Calves in particular have high concentrations of *Cryptosporidium parvum* in their feces in the springtime. Due to relatively long winters in Alberta and Saskatchewan a significant reservoir of *Giardia lamblia* and *Cryptosporidium parvum* can be stored on the land over the winter and has the potential to be washed into the river during spring melt. It is during spring melt, usually from mid-March to mid-April, that the highest concentrations of *Cryptosporidium parvum* have been observed, again based on the testing conducted by EPCOR. This testing has found concentrations in excess of 10,000 oocysts per 100 litres of water. Dr. Stanley testified that the number of oocysts per 100 litres on an average basis might be in the 50-60 range, but in the spring of 2000 testing indicated that there were concentrations of 3,000 oocysts per 100 litres. He testified: "...so that we will see very high numbers that are high compared to anywhere in North America on the North Saskatchewan River."

Fig.2
NORTH SASKATCHEWAN RIVER CRYPTOSPORIDIUM CONCENTRATIONS
(1992 TO 2001)



Source: Dr. Steven Stanley Assessment Report
EPCOR water Services, Inc.
Exhibit C-88

Edmonton is located approximately 500 kilometres upstream from North Battleford, Saskatchewan. Prior to April, 2001, there was no testing for *Cryptosporidium parvum* in the river water in the area of North Battleford. However, there is no reason to believe that oocyst concentrations in the area would be any less than those found in Edmonton. An additional consideration in North Battleford is the fact that the sewage treatment plant for the city is located approximately 3,500 metres upstream from the raw water intake for its surface water treatment plant. Wastewater is known to be very high in *Cryptosporidium parvum* and *Giardia lamblia*.

Dr. Stanley indicated that the North Saskatchewan River is fairly heavily monitored west of Edmonton by both EPCOR and the provincial regulator. *Cryptosporidium parvum* and *Giardia lamblia* testing has become routine in recent years. The purpose of such monitoring and testing is to establish baseline measurements at various times of the year, and thereafter ascertain any changes to water quality with a view to ameliorating adverse changes. Likewise, the City of Saskatoon monitors the South Saskatchewan River from the Gardiner Dam to Saskatoon, a distance of approximately 80 kilometres.

There are three surface water treatment plants in Saskatchewan that rely on the North Saskatchewan River as a raw water source: Lloydminster, North Battleford, and Prince Albert. There is one monitoring station at the border between Alberta and Saskatchewan. It is operated by the Prairie Provinces Water Board and monitors a variety of water quality parameters but does not test for protozoa. The results of this monitoring are not made available to municipalities. The Province of Saskatchewan does not monitor the river at all.

The City of North Battleford's sewage treatment license requires it to monitor the North Saskatchewan River at three locations at least once every three months for coliforms. The locations are upstream of its sewage treatment plant, at the sewage effluent discharge point, and at the downstream raw water intake to the surface water treatment plant.

The City of Prince Albert does not routinely monitor its raw water. It is not known if the City of Lloydminster does so or not because, at the last minute, in the last week of the inquiry, Lloydminster refused to allow its water treatment manager to testify as had been previously arranged. It was decided the inquiry would not be extended for the purpose of compelling such attendance.

This inquiry did not hear evidence on what riparian activities take place on the North Saskatchewan River from the Saskatchewan border to its confluence with the South Saskatchewan River east of Prince Albert. Saskatchewan Agriculture issues licenses with respect to intensive livestock operations and the environmental regulator has the opportunity to review such applications. What criteria are applied for granting such licenses was not investigated, but it does not include monitoring of raw water quality in the immediate area of the activity.

There are other significant challenges to water treatment facilities located on the North Saskatchewan River, including pH levels of the water (which one operator testified he had seen as low as 7.3 and as high as 8.9), and the temperature of the water, which varies from 0° in the wintertime to 23/24° in the summer. While water treatment facilities are concerned with treating water to deal with inorganic materials, organic materials, and biological organisms, it is only treatment of the latter that was the focus of this inquiry.

As noted in the introduction, the first barrier in the multi-barrier approach to the treatment of all surface water is watershed protection. For example, the City of New York and the City of Vancouver own or control large portions of the watershed they rely upon for source water. The cleaner the source water, the less necessary it is to place reliance on the subsequent barriers.

There is no existing watershed protection policy for the North Saskatchewan River in Saskatchewan. A number of government departments have responsibility for licensing or permitting riparian activity. Some of this activity must go through an assessment process. There is significant riparian agricultural activity for which no license or permits are required.

FINDINGS

1. The North Saskatchewan River has high numbers of *Cryptosporidium parvum* parasites; numbers that are as high as anywhere in North America.
2. There is no coordinated watershed protection program in Saskatchewan on the North Saskatchewan River.
3. The North Saskatchewan River is a difficult raw water source to treat for drinking water.

2. *Cryptosporidium parvum*

The inquiry heard evidence from Dr. Miodrag Belosevic, a professor of biological sciences at the University of Alberta, who is recognized internationally as an expert in the areas of detection and control of water-borne parasites, including *Cryptosporidium parvum.*

Water-borne infections include bacterial, viral, and protozoan. *Cryptosporidium parvum* and *Giardia lamblia* are protozoan parasites ubiquitous in surface waters. Generally, they exist in relatively low numbers, for example, one parasite in 10,000 litres of water, but, as noted earlier, during periods of runoff the number of these organisms can increase dramatically.

There are approximately 50-60 different species of *Cryptosporidium* that can infect birds, fish, reptiles, and mammals, but it is *Cryptosporidium parvum* that is commonly associated with the infection of human and animal populations. There are two genotypes that have been identified in *Cryptosporidium parvum.* Genotype 1 can, on present knowledge, only infect humans. Genotype 2 is thought to be of animal origin but can also be infectious of humans (zoonosis).

Oocysts are the environmental stage of a parasite's life cycle and are excreted in the feces of infected hosts. They are immediately infectious upon excretion. Infection with *Cryptosporidium parvum* occurs by ingestion of oocysts through fecal-oral transmission which may be person-to-person, animal-to-person, or via contact with contaminated food, water, or environmental services.

Cryptosporidiosis is the disease condition resulting from infection with *Cryptosporidium parvum* oocysts. A relatively low number of parasites can initiate an infection. Thereafter, these organisms multiply in the host and eventually become full-blown infections in susceptible hosts, potentially running in recurring cycles. As a result of this multiplication and recycling, these infections are associated with considerable potential for contamination of the environment.

Once *Cryptosporidium parvum* oocysts are ingested, there is a latent period of five to ten days during which the parasites are not seen in the patients' stool. Next comes the acute phase that can last from two to three weeks, but up to eight weeks depending on the ability of the individual to eliminate infection. During the acute phase there is a large increase in the number of infectious forms accompanied by symptomology usually involving one or more of diarrhoea, abdominal cramps, nausea, headaches, fever, etc. In immune-competent individuals, meaning those with a well-functioning immune system, the infection is self-limiting and will normally be eliminated from the body. Evidence suggests some degree of resistance develops following numerous exposures to the parasite.

Immune-deficient persons cannot eliminate the parasite and may suffer from very long-lasting chronic infections. Chronicity in turn results in increased symptomology and more pathology becoming associated with the infection. HIV infected individuals do not have the ability to eliminate the parasite and may suffer from debilitating illness that can last years. There are reports and literature of HIV patients dying from cryptosporidiosis.

Dr. Belosevic provided estimates that approximately 20% of the general population may be considered as high risk. This includes very young children who do not have well-developed immune systems, the elderly whose immune system is waning to some extent, pregnant women who experience immunosuppression during pregnancy and lactation, persons undergoing chemotherapy, and immune-deficient persons such as those with HIV.

Unlike *Giardia lamblia*, presently there are no drugs that can deal effectively with cryptosporidiosis. Dr. Belosevic indicated a host of research programs selectively designed to discover chemotherapeutic agents that will be effective against cryptosporidiosis, but so far they have been largely unsuccessful.

Due to their very small size (2-5 microns across), *Cryptosporidium parvum* oocysts are very difficult to remove from raw water. They are also very difficult to kill because an impermeable layer of sugar molecules, known as the glycocalex, forms the exterior shell of the oocysts. This sugar layer makes the oocysts highly impermeable to weak oxidants or weak chemical disinfectants such as chlorine.

There are two sources of parasites in the environment: uncontrolled non-point sources and point sources. An example of a point source of contamination is the sewage treatment plant located upstream from the raw water intake of the surface water treatment plant in North Battleford. Another example of point source contamination is intensive livestock operations on riparian land. Watershed protection is a well-recognized and desirable barrier against not only prospective bacteria and parasites entering water sources but also with respect to chemical pollutants as well. Most major outbreaks that have occurred with protozoan parasites originated with point source contaminations. The largest outbreak of cryptosporidiosis in North America associated with a municipal water supply occurred in 1993 in Milwaukee, Wisconsin. The outbreak was responsible for causing gastroenteritis in an estimated 403,000 people, and over 100 persons died as a result. Dr. Belosevic testified the final report on the Milwaukee outbreak indicated there was a very high likelihood, although not absolute, that the source of the *Cryptosporidium parvum* was a waste treatment plant located three to five kilometres above the drinking water intake in the lake from which the raw water was drawn. The genotype of the *Cryptosporidium parvum* in that outbreak was the human type. As will be touched on later herein, *Cryptosporidium parvum* genotype 1 (human genotype) was confirmed in 11 of the 12 patient fecal specimens that were tested for genotype as a result of the North Battleford outbreak. One patient's specimen could not be genotyped.

There are a number of reports of *Cryptosporidium parvum* finding its way into ground water wells. This can occur through surface water runoff entering the wells, and also from wells recharging from a surface water source, which can occur when wells are drilled too close to a surface water source such as the North Saskatchewan River. There was no evidence given at the inquiry of this having occurred in North Battleford.

With respect to detection of *Cryptosporidium parvum* in both raw water sources and in finished treated water, Dr. Belosevic indicated that trying to find the small protozoa in large bodies of water can be equated to looking for a needle in a haystack. He told the inquiry that in laboratory seeding tests, where a known number of parasites are put in a large volume of water, 50-60% of these organisms can be recovered. He stated that if raw water is used, for example from the North Saskatchewan River, the recovery rates drop to around 10%, due to the fact the water is far more turbid.

Dr. Belosevic's opinion was that monitoring raw water supplies is essential in the overall operation of a properly run water facility. He made the point that recovery rates of protozoa such as *Cryptosporidium parvum* and *Giardia lamblia* are very low. When they are found, however, it is a red flag and one can assume that more of the same parasites are present. A large sample of water is required to conduct the tests for parasites. Approximately 100 litres is recommended.

Dr. Belosevic recommended the testing of treated water from time to time in order to determine how efficiently the water treatment plant is operating. The testing of treated water for oocysts is concerned mainly with determining if such oocysts are viable or non-viable. In other words, if oocysts are present, did the water treatment process render them non-viable? The testing for *Cryptosporidium parvum* and *Giardia lamblia* in treated water is not widespread, but larger facilities are increasingly doing so. There are two problems associated with testing treated water for these parasites. The first is that the low recovery rate requires that a fairly large volume of water be tested. The second is that, while there are chemical means of identifying whether the parasites are present in treated water, the chemical means to determine viability, or the infectiousness, of the oocysts have not yet been developed to an acceptable standard. The present "gold" standard with respect to the viability of oocysts is called the animal infectivity test, which is complex and expensive, averaging $3,000-$4,000 per test. For these reasons, regulatory authorities in North America have tended not to stipulate for testing for parasites in treated water, but have relied on the multi-barrier approach to remove such parasites from the treated water before it is released into the distribution system. The United States authorities have implemented a log reduction approach that will be dealt with later. For a brief description of the multi-barrier approach, see Introduction, page 5.

Despite the various chemical and mechanical processes used in surface water treatment plants to settle out organisms from raw water, there will always be some organisms that will survive the processes, and for this reason a further barrier is highly recommended. There are two treatment processes that are quite effective against *Cryptosporidium parvum* and *Giardia lamblia*.

Medium pressure ultraviolet light has been shown in laboratory tests to be very effective in killing *Cryptosporidium parvum*. However, all tests done to date have been done on relatively low turbidity water, and there is no data set that has looked at U.V. inactivation in highly turbid water as can occur during periods of high runoff. Preliminary results of tests now being conducted suggest that U.V. inactivation will be affected by increases in turbidity. The drawback to U.V. treatment is that it is not effective on bacteria and viruses, which simply emphasizes the need for multiple disinfection processes, including chlorination, which is very effective on bacteria such as *E. coli*.

The second barrier that is effective to some degree against *Cryptosporidium parvum* is the introduction of a strong oxidant such as ozone into the raw water during the treatment processes. Introduction of ozone makes the surface of the parasite more porous and enables chlorine to enter the oocyst and emasculate it. *E. coli* is highly susceptible to ozone. *Giardia lamblia* is a bit more susceptible to ozonation than is *Cryptosporidium parvum*, which is the least susceptible. Dr. Belosevic indicated that at contact times as long as 15 minutes the reduction of *Cryptosporidium parvum* is only about two and one-half logs versus six logs for *E. coli*. A log unit is to the power of 10. Therefore, one log is 10, two logs is 100, three logs is 1,000, etc. If one is starting with 100 organisms, a two and one-half log reduction would result in killing all of them. However, if starting with 1,000 organisms or more, obviously a significant number of parasites would be left over.

Water quality also affects the level of kill that will be obtained following chemical inactivation by ozone. The relevant water quality factors are turbidity, the pH level, and the temperature of the water. With most of the chemical inactivation processes available, effectiveness or efficiency decreases at low temperatures. During the winter months, raw water from the North Saskatchewan River is at 0-1°. Therefore, if part of the treatment process is the addition of ozone, the amount of ozone introduced into the raw water should be increased during the winter months and decreased during the summer months when raw water temperatures for the North Saskatchewan River can reach 24°. The major concern with ozone is that it generates bromate, which tends to be carcinogenic. Evidence given at the inquiry suggests that the United States Environment Protection Agency (US EPA) intends to legislate the level of bromate allowed following ozone disinfection in the year 2002 or 2003. To emphasize the significance of the concentrations of *Cryptosporidium parvum* that have been found in the North Saskatchewan River, Dr. Stanley referred to the US EPA's proposed long-term enhanced surface water treatment rule (2000). Under this proposed rule, additional treatment for *Cryptosporidium parvum* will be required at 7.5 oocysts per 100 litres in the raw water. If concentrations are below this level the US EPA will require conventional treatment to produce a treated water turbidity of less than 0.3 NTU, 95% of the time. If concentrations are above this value, additional treatment for *Cryptosporidium parvum* will be required. At levels seen in the North Saskatchewan River, treatment facilities would be required to have an additional two log treatment for *Cryptosporidium parvum* above that provided by a conventional plant that produces less than 0.3 NTU water.

Many facilities, including Edmonton, maintain treated water reservoirs on site for the purpose of increasing the chlorine contact time (at least six hours) to ensure a proper kill of *Giardia lamblia*. The North Battleford surface water plant does not do this, nor is it designed to do this. Water can pass through the North Battleford plant at peak periods in as little as one hour.

The evidence at this inquiry indicates that *Cryptosporidium parvum* outbreaks have not been commonplace or significant in Saskatchewan prior to the outbreak in North Battleford.

3. Guidelines, Standards, and Permits

(a) Canadian Drinking Water Quality Guidelines

Much of the work done to determine the maximum levels of the constituents set out in the guidelines is performed by Health Canada. Drinking water guidelines are developed primarily by the Federal/Provincial/Territorial Committee on Environmental and Occupational Health (CEOH) subcommittee on drinking water standards (DWS). Each provincial and territorial jurisdiction has a representative on the subcommittee, and Health Canada has two members. Saskatchewan's representative on this committee since 1998 has been Mr. Thon Phommavong, who has a master's degree in environmental engineering and is a senior standards analysist with SERM. Mr. Phommavong described the mandate of the DWS subcommittee in his testimony as follows:

> Our mandate is to provide advice to CEOH on matters that affect provisions of wholesome drink – provision of wholesome drinking water, with emphasis on collecting, evaluating national and international information on drinking water parameters and their potential health impact. Also, develop and recommend guidelines for potable water quality based on health assessment, treatment costs, and economic analysis. That was the mandate that was agreed upon.
>
> We also, to review and evaluate the existing technology, as is – as is pertaining to guideline development, we also promote and exchange information within drinking water jurisdictions. We – we share information and expertise during these meetings. We also identify future research needs to promote and encourage research in drinking water issues in Canada.
>
> And we also prepare communications and publications such as Canadian Drinking Water Quality Guidelines and also additional information and materials. All of these informations are posted on the Health Canada website.

The sixth edition of the Canadian Drinking Water Quality Guidelines (the "Canadian Guidelines") was published in 1996 and the seventh edition is presently in draft form. Mr. Phommavong indicates that among the matters considered by the DWS subcommittee when evaluating new recommendations are available treatment technologies, the control measure proposed, and socio-economic factors. He stated that typically the committee does not want to develop any guidelines where the control technology is not in place to meet the parameters being proposed. The Canadian Guidelines, for the most part, outline maximum acceptable concentrations (MAC) known or suspected to cause adverse effects on health.

The microbiological guidelines, which address the control of disease-causing micro-organisms, make the point that it is not practical or technically feasible to monitor for all pathogens in drinking water, so the guidelines are based on indicator organisms and effective treatment. The main indicator organism relied upon is total coliforms. The guideline states that no water sample should contain more than 10 total coliform organisms per 100 millilitres and none of these should be fecal coliforms. Mr. Phommavong indicated that DWS is now looking at *E. coli* as an additional surrogate parameter.

The Canadian Guidelines also address turbidity. Turbidity measurements relate to the optical property of water that causes light to be scattered and absorbed rather than passing straight through the sample. The current method of choice for measuring turbidity is the nephelometric method, and the unit of measurement is the nephelometric turbidity unit (NTU). The Canadian Guidelines specify the MAC for turbidity in water entering a distribution system as 1 NTU and go on to provide as follows:

> Provision of treated water at or below this limit will minimize the introduction of unfavourable particulate and biological matter into the distribution system and thereby render better disinfection opportunity, effectiveness, and maintenance. Special site-specific problems may require more rigorous attention for the production of low-turbidity water. Any sudden increase in the turbidity of the finished water indicates deteriorating quality of the raw water or loss of control in the water treatment processes.
>
> Certain water supplies, such as ground water, may contain non-organic-based turbidity, which may not seriously hinder disinfection. Therefore, a less stringent value for turbidity in water entering a distribution system may be permitted if it is demonstrated that the system has a history of acceptable

> microbiological quality and that a higher turbidity value will not compromise disinfection.
>
> Turbidity in excess of 5 NTU becomes apparent and may be objected to by a majority of consumers. Therefore, an AO of ≤5 NTU has been set for water at the point of consumption.

As will be observed from the foregoing, and as noted by Dr. Stanley, bacteria are able to hide in particulate matter and this affects the ability of chlorine to kill them. The 1 NTU MAC for turbidity was not established because it was thought at 1 NTU enough bacteria would be removed, but to make sure that the particulate matter was low enough in concentration so that the chlorine would be effective.

Under the heading "Disinfection," article 3.5 of the Canadian Guidelines states:

> Disinfection is the one step in water treatment specifically designed to destroy pathogenic organisms and thereby prevent water-borne diseases, which are the most significant health risk associated with drinking water. Alone, disinfection is not always sufficient to produce a supply of adequately treated water. Other treatments may be necessary, depending upon the water source, to ensure the effectiveness of the disinfection process and to satisfy other criteria for good-quality drinking water. The disinfecting agents most commonly used in water treatment today are chlorine and its compounds.

With respect to viruses and protozoa, the Canadian Guidelines state in article 3.3:

> Guidelines for viruses and protozoa are not proposed at this time, but relevant information is currently being reviewed (See Figure 3). It is desirable, however, that no viruses or protozoa (e.g. Giardia) be detected. A water treatment system that provides effective filtration and disinfection and maintains an adequate disinfectant residual should produce water of an acceptable quality in this regard. Where possible, source protection should also be exercised.
> [emphasis added]

Fig. 3

PARAMETERS UNDER REVIEW OR SCHEDULED FOR REVIEW

Parameters	Parameter
aluminum	methyl-4chlorophenoxyacetic acid, 2- (MCPA)
antimony	Nickel
bromate	organotins
chlorates + chlorites + chlorine dioxide	protozoa
cynobacteria toxins	total petroleum hydrocarbons (TPH)
dichlorophenoxypropionic acid, 2,4- (dichlorprop)	trichloroethylene
fluoride	viruses
formaldehyde	uranium
haloacetic acids	

Source: *Guidelines for Canadian Drinking Water Quality*
Sixth Edition, Federal-Provincial Subcommittee on Drinking Water of the
Federal-Provincial Committee on Environmental and Occupational Health
Health Canada: Ottawa, 1996
Exhibit C-42 Tab A8

Mr. Phommavong testified the reason no guidelines for protozoa have been established is due to the technical difficulty and cost of recovering parasites such as *Giardia lamblia* and *Cryptosporidium parvum*, and thereafter determining their viability. He stated DWS always has in mind that, for no risk to human health, the standard for pathogens in drinking water should be zero. From a technical prospective, however, such a goal is not economically feasible. He stated the water industry recognizes as an acceptable microbial quality risk one in 10,000 persons, which is an assessment risk model developed by US EPA. If this same goal was used for *Cryptosporidium parvum*, and assuming one live oocyst of the human genotype could cause illness if consumed, the theoretical MAC would be 0.044 cysts per 1,000 litres of water. This is considered below detectable limits because to find one oocyst one would have to test a sample of 23,000 litres of water. At the present time the known recovery rate of *Cryptosporidium parvum* oocysts does not exceed 50%. If one oocyst was found as a result of such testing, a further test to determine the viability of the oocyst would then be required. As noted earlier, the animal infectivity test is the only reliable test at this time and has an average cost of $3,000-$4,000 per test.

Mr. Phommavong indicated that while turbidity is not a direct surrogate indicator for *Cryptosporidium parvum* or *Giardia lamblia*, scientists have been able to observe a significant relationship between turbidity spikes and the number of *Giardia lamblia* or *Cryptosporidium parvum* in the treated water. As a result, the revised Canadian Guidelines, which are presently in draft form, will recommend a turbidity MAC of 0.3 NTU, 95% of the time.

(b) Industry Standards Since 1989

The US EPA turbidity standard has been 0.5 NTU since 1989 when it was reduced from 1 NTU in recognition of the fact that particulate removal was an important barrier against the presence of *Giardia lamblia* in drinking water, even though chlorine is somewhat effective against it. In the 1990s, *Cryptosporidium parvum* became the focus of the water industry in the United States following the *Cryptosporidium parvum* outbreak in Milwaukee in 1993 where over 400,000 people became infected. In 1995, a number of water utilities in the United States, under the sponsorship of the America Waterworks Association (AWWA) and the US EPA, became involved in a voluntary program to achieve 0.1 NTU turbidity as a goal that offered the best protection against *Cryptosporidium parvum* surviving the water treatment process. As noted above, the Saskatoon water treatment utility meets this objective. The Prince Albert water utility, which is also on the North Saskatchewan River, has as its operating guideline 0.2 NTU. As of January 1, 2002, US EPA is proposing a reduction from 0.5 NTU to 0.3 NTU.

The United States, the Province of Alberta, and more recently the Province of Quebec, have adopted a log removal approach to *Giardia lamblia* and *Cryptosporidium parvum*. The goal is to achieve 99.9% removal of these parasites in the raw water source. The model contemplates that a well-functioning filtration and disinfection plant that can achieve 0.5 turbidity in the treated water should be credited with a two log reduction, which assumes a 99% removal rate. The coagulation-flocculation-sedimentation process under this model is given credit for an additional 0.5 of a log. Depending on the number of oocysts estimated to be in the raw water, the model contemplates an additional 0.5 to 2.5 log reduction may be required to achieve a 99.9% removal rate. For example, the license for EPCOR's water utility in Edmonton requires it to achieve a 4 log reduction. It does so by holding its treated water in reservoirs for a period of three to six hours to increase the contact time for chlorine to be effective on *Giardia lamblia*. This process gives it credit for an additional 1.5 logs, which is in effect a disinfection credit.

However, because chlorine is not effective against *Cryptosporidium parvum*, a United States task force is currently recommending a 3 log removal for this parasite. While *Cryptosporidium parvum* has been a major concern of the water industry for the past ten years, it is the advent of U.V. disinfection technology that has provided a reliable and economically feasible barrier to *Cryptosporidium parvum*. As noted above, ozone has been recognized for some time as somewhat effective against *Cryptosporidium parvum*, but the problem with its byproduct, bromate, has limited its available use.

The foregoing approach to water treatment over the past ten to twelve years with respect to *Giardia lamblia* and *Cryptosporidium parvum* has been reviewed simply to point out industry awareness and actions taken with respect to these parasites. Mr. Rick Hanson, manager of the water utility in Prince Albert, indicates he has been aware of the problem of *Cryptosporidium parvum* since Milwaukee. In the years 1995 and 1996, and again in 2001, his utility has done random testing of both raw and treated water for *Giardia lamblia* and *Cryptosporidium parvum*. He indicated that after Milwaukee he acquired information, including a videotape on *Cryptosporidium parvum*, which he shared with his operating staff. Evidence to be reviewed later herein suggests there was no such awareness in the plants department in North Battleford.

(c) The Saskatchewan Drinking Water Guidelines

In March, 1991, Saskatchewan published a document entitled "Municipal Drinking Water Quality Objectives" (the "Municipal Objectives") which replaced a 1980 edition with the same title. The document, for the most part, adopts the same standards and objectives as the Canadian Guidelines; however, the bacteriological MAC is more stringent. The Saskatchewan Guideline is 0 total coliforms per sample, whereas the Canadian Guidelines would allow up to 10 total coliform organisms per 100 millilitre sample, none of which should be fecal coliforms, and states that not more than 10% of the samples based upon a minimum of 10 samples should show the presence of coliform organisms.

There is no reference to protozoa in the Municipal Objectives. The MAC for turbidity is the same as the Canadian Guidelines of 1 NTU for surface water. In March, 1996, SERM published a document entitled "Municipal Drinking Water Quality Monitoring Guidelines." This document updated and replaced Appendix "A" to the Municipal Objectives of 1991. Again, there is no mention of protozoa. This document is more deficient than the 1991 objectives with respect to its discussion on turbidity. The discussion does not suggest that a target below 1 NTU should be pursued depending on the raw water source. It mentions the desirability of using turbidimeters, but in a context that suggests they should be used in order to achieve 1 NTU. This section states: "depending upon the composition of the turbidity, interference with chlorination can range from negligible to severe." It was known at this time that chlorination has little or no effect on *Cryptosporidium parvum.*

The chlorine requirements for operators of water utilities are set out in s. 23(4) of *The Water Pollution Control and Waterworks Regulations* of Saskatchewan as below:

> 23(4) Unless otherwise approved, the owner or operator of a waterworks shall cause to be maintained:
>
> (a) a free chlorine residual of not less than 0.1 milligrams per litre in the water entering a distribution system; and
>
> (b) a total chlorine residual of not less than 0.5 milligrams per litre or a free chlorine residual of not less than 0.1 milligrams per litre in the water throughout the distribution system.

In September, 1995, SERM prepared an internal report entitled "Municipal Drinking Water Quality" that was not published to the industry. The foreward stated: "[t]he purpose of the report is to recommend strategies to solve problems...." One of the topics reviewed in article 3.11 was the regulatory option of introducing standards as a replacement for guidelines for drinking water. In this section it is noted that several provinces in Canada, as well as the US EPA, have implemented standards for a wide range of parameters in drinking water, and that the federal government was also planning to legislate drinking water standards for federal facilities. The report offers, in part, the following reasons for recommending against such an approach:

> There are a number of reasons why specific levels or standards have not been set for the various parameters to date. The vast majority of communities respond to exceedances of Municipal Drinking Water Quality Objectives or water treatment problems as soon as possible. In cases where new water supplies or construction of upgraded treatment works are put in place to remediate, such actions take time. It is unlikely that a community's non-compliance with a drinking water standard during this period would change the process to improve health protection. Section 2 notes the substantial number of communities that have inadequate water treatment works and exceedances of the Municipal Drinking Water Quality Objectives. Establishing drinking water standards at the same level as these objectives would have serious implications. The objectives are based on "acceptable" health risks for lifetime exposure rather than an acute health hazard which demands immediate compliance. Due to the need to examine various risk management options, it is not possible to resolve all problems at once. It is expected that many communities could not comply with such drinking water standards. The public may perceive greater risk if there is non-compliance with a standard rather than exceedance of an objective. This would not promote public confidence in programs for protection of public health.
>
> If Saskatchewan would set drinking water standards for specific parameters based on acute health hazards or provincial conditions there would be confusion and controversy about the levels not being consistent with the Canadian Drinking Water Quality Guidelines. This is not a viable option.

FINDINGS

4. The Municipal Drinking Water Quality Objectives of 1991, and the guidelines of 1996, were not adequate as informational or instructional material for owners and operators of surface water treatment plants on the topics of turbidity and protozoa. By 1996, industry practice with respect to both of these topics had become much more stringent for surface water treatment plants and the document issued in 1996 did not draw attention to this fact. *Cryptosporidium parvum* and *Giardia lamblia* were not identified in either document as a threat to safe water treatment, nor was the relationship between protozoa and turbidity discussed.

5. The 1 NTU guideline for turbidity is so general as to be unhelpful as an objective for surface water treatment where *Cryptosporidium parvum* and *Giardia lamblia* are known to be present.

6. The 1 NTU guideline for turbidity became a trap for municipalities who were not knowledgeable in optimum water treatment practices, a category which included the City of North Battleford.

(d) North Battleford's Permit to Operate a Waterworks

Since 1997, permits to operate waterworks in Saskatchewan have been issued by SERM EcoRegion officers. The most recent permit for the City of North Battleford is dated March 26, 1998. The term of the permit is stated to be indefinite "...however the Department may, at any time, amend this order to include changes that were made to the Municipal Drinking Water Quality Guidelines, the Canadian Drinking Water Guidelines or to protect public health."

The permit stipulates five conditions:

1. The City shall maintain records containing the following information during the term of this Order:

    (a) annual operating records; and

    (b) information satisfactory to the Minister respecting the collecting of samples and the analyses required by this Order.

2. The City shall monitor water quality pursuant to the attached Waterworks Monitoring Schedule.

3. The City shall make any records and information required to be recorded pursuant to Condition 1 to the Parkland EcoRegion upon request. The City shall direct their agent or laboratory conducting any analysis to provide the results directly to the Parkland EcoRegion.

4. The City shall collect samples, analyze and measure as required by the Conditions in this Order in accordance with procedures acceptable to the Minister.

5. The City shall notify Saskatchewan Environment and Resource Management whenever the chlorination equipment malfunctions.

Attached to the permit is a Waterworks Monitoring Schedule. The schedule requires, in part, bacteriological sampling and testing three times per week from six representative locations in the distribution system, and requires continuous sampling for turbidity in the surface water treatment plant.

It will be observed that, except for the water quality monitoring schedule, the foregoing permit imposes minimum conditions in the most general of terms. North Battleford's permit is to be contrasted with the permit issued to the City of Prince Albert water treatment plant by a different EcoRegion. This permit, dated July 20, 2000, is for a five year period, as opposed to an indefinite period, and requires the city to supply SERM with an operating manual for the water treatment plant before March 31, 2001. It also requires the city to report quarterly and annually on a number of matters set out in section 3 of the permit:

> 3.0 REPORTING
>
> 3.1 Quarterly Reporting
>
> 3.1.1 The results of the water quality monitoring program as per Appendix A, shall be submitted to the Department within six weeks of the end of the quarter being reported. The City shall review the data prior to the submission with respect to accuracy and completeness, water quality limits and operational action levels. Any unusual results shall be explained in writing.
>
> 3.1.2 Monitoring data shall be presented numerically in tables and in graphical format. The graphical format will present individual sampling analysis, and be presented as an accumulation of data presenting at least the most recent 12 months of data.
>
> 3.1.3 The City shall include within this report a section detailing a complete monthly reagent balance for each month in that quarter. This will show chemical reagents used in water treatment and will explain the eventual fate of those chemicals and compounds.

3.2 Annual Report

3.2.1 A report based on the previous calendar year shall be submitted to the Department by June 30 of the following year. This report shall include but not be limited to the following:

(a) data from the water quality monitoring program, summaries and a detailed interpretation of the data, as specified in Appendix A;

(b) performance with respect to water quality limits;

(c) documentation of any past or proposed operational changes, changes in the treatment systems or any significant events that could affect the water quality or the environment;

(d) update on the quality assurance program for the field and laboratory procedures performed by both the City's field staff and analytical laboratories;

(e) a discussion on findings from an annual review of the chemical usage detailed in clause 3.1.3. The goal of the review will be to minimize the amount of chemicals being discharged into the drinking water system, the sewage system, or directly to the river.

It is inconsistent that two surface water treatment plants obtaining raw water from the same raw water source, in this case the North Saskatchewan River, should have different requirements imposed in their respective operating permits. This inconsistency raises the question of whether such permits should be issued by a central authority as opposed to five different EcoRegions. North Battleford had not been requested to produce an operating manual for its water treatment plant prior to April, 2001, nor was it subject to the requirements imposed on the Prince Albert plant.

FINDINGS

7. It is inconsistent that two surface water treatment plants obtaining raw water from the same raw water source, in this case the North Saskatchewan River, should have different requirements imposed in their respective operating permits.

RECOMMENDATIONS

1. **That the criteria for surface water treatment plants reporting to SERM be standardized for the province, and not differ between EcoRegions.**

4. The "Capable" Surface Water Treatment Plant

The typical surface water treatment plant encompasses coagulation, flocculation, sedimentation, filtration, and disinfection processes. The surface water treatment plant operated by the City of North Battleford is a conventional plant in the foregoing respects. The focus of the treatment processes is directed at the removal of small particulate matter, which is the major mechanism for *Cryptosporidium parvum* removal given its resistance to chlorine.

The particulate removal process, and the science behind the same, were outlined by Dr. Stanley in a report prepared by him as a supplement to his oral testimony. This process was not well understood by the operators of the North Battleford surface water plant, and this may be the case as well with other operators in the province. For this reason, part of Dr. Stanley's report on this topic is hereafter set out verbatim.

> Coagulation and Flocculation Process
>
> The goal of the coagulation and flocculation process is to facilitate the removal of small particles in the sedimentation and filtration processes that follow. Of specific concern is the removal of particles in the 2 to 10 micron size range, as this is the size range of Cryptosporidium and Giardia. Most small particles in natural waters, including Cryptosporidium oocysts, are negatively charged. As they are all negatively charged they tend to repel each other and will not clump together to form larger particles. In addition, particles in this size range settle very slowly (in the order of days to settle through 1 metre of water). As sedimentation tanks in water treatment plants normally have residence times in the order of hours, particles in this size range are poorly removed through sedimentation. However, the settling velocity of particles increases with particle size. In fact, a particle that is ten times larger will have a settling velocity which is 100 times faster. If these small particles can be agglomerated into larger particles they can be removed effectively in the sedimentation process. Coagulants are used to accomplish this. Coagulants aid in the removal of small particles through two primary mechanisms: charge neutralization and sweep floc or enmeshment. In charge

neutralization, a strongly positively charged ion is added to the water. The most commonly used coagulant is alum. When alum is added to water an aluminum ion is released which has a strong positive charge. The goal is to have this ion attach to the negatively charged particle and neutralize the charge. Once the charges have been neutralized these small particles will not repel each other and if they bump into another particle they will tend to agglomerate forming a larger particle which will have a higher settling velocity. To make these particles bump into each other, flocculation is used which consists of slow mixing which encourages particle contacts. Charge neutralization is also important for good filter performance. It is important to realize the pore spaces in normal sand filters are much larger than the small particles we want to remove. The major mechanism for small particle removal in a filter is not straining (where the particle is bigger than the pore spaces) but attachment processes. As the small particle travels through the sand filter it bumps into the sand particles. Sand particles also tend to be slightly negatively charged and if the small particles have not had their charge neutralized they will tend to be repelled by the sand particle, not attaching to it and have a high probability of travelling completely through the filter. If the charge has been neutralized they will tend to attach to the sand particle and be captured. Proper coagulation is the key to good filter performance, especially for the removal of small particles.

The challenge with charge neutralization is that the aluminium ion will also react with water through a series of complex hydrolysis reactions forming aluminum hydroxides which are not strongly positively charged and not effective in neutralizing the charge of small particles. These reactions occur quite fast so it is essential that rapid mixing occurs when the alum is added to allow the aluminum ion to come in contact with the particles before these reactions take place. If good mixing is not present, effective charge neutralization of the small particles will not occur. In addition, the right dose of alum must be added which is dependent on the amount of particles in the water.

The second mechanism through which coagulation aids in the removal of small particles is through sweep floc or enmeshment. As described above, when alum is added to water the aluminum reacts with water to form aluminum hydroxides. Some of the aluminum hydroxides formed are precipitates (solids). As these solid aluminum hydroxides form and grow into larger flocs small particles are enmeshed in them. These aluminum hydroxide flocs are either settled in the sedimentation process or filtered out, hence removing some of the small particulate matter in the water. The species of aluminum hydroxides that are formed are dependent on the pH of the water. As mentioned only some of the aluminum hydroxides species formed are solids. The maximum amount of the solid aluminum hydroxides species are formed around a pH of 6.5. At pH's much greater than 7 these solid aluminum hydroxides are not formed and the sweep floc mechanism does not occur. When alum is added to water it lowers the pH and normal practice is to have the water pass through the clarification process at lower pH (hopefully less than 7) to optimize this process. Typically, either directly before or after the filters the pH is then raised (typically to around 7.5 or higher) as low pH in the distribution system can accelerate corrosion of the pipes.

Solids Contact Unit

Solids contact clarifiers are a common type of clarification unit used in water treatment. They have a number of advantages as well as some disadvantages. The general concept is that you recycle large quantities of flocs (agglomerated particles and aluminum hydroxides) in the tank increasing the chances of collisions of these particles with small particles that are coming into the tank. For these small particles to attach to the flocs when they collide it is still important that the charges have been neutralized. As there is more chance of small particles colliding with large flocs due to the recycled flocs and the larger [the] flocs the faster the settling velocity, typically higher flow rates per unit size of the clarifier can be passed through these systems compared to other types of clarifiers. However, if not enough particles are in the unit and collisions do not occur with small particles, these units can perform poorly due to the higher flow rates that go through them. In addition, these units tend to be more operational intensive as not only must the coagulant dose be right, but the right amount of solids must be present in the unit. If too many solids are present the unit can be plugged off and if too few solids are present small particles will not be removed efficiently. This generally makes this type of clarifier more difficult to operate, especially in changing water quality conditions.

The primary purpose of the clarification process is to limit the particle loading to the filters. Typical rapid sand filters can handle particle loadings in the range of a maximum of 5 NTU. At turbidities at the higher end of this range filter runs become short and it is difficult to produce a sufficient quantity of water. It is possible, if the coagulation process is optimized, to still produce good quality water at the higher end of these loading rates coming off the clarifier to the filters. However, it is not efficient and requires close monitoring of filter performance to ensure backwashing occurs when filters become exhausted. Data from North Battleford indicates that clarified water turbidity was in the range of 5 NTU through most of March and April [2001].

Filtration

Filtration is the most important process for the removal of small particles in water treatment. Its performance however is largely dependent on the performance of the upstream processes of coagulation, flocculation and clarification.

A typical filter run after backwash consists of three stages. In the first stage the filter is ripening and during this time the performance is poor. Figure 4 shows the first 2 hours of a typical filter run. Although this stage typically lasts less than 30 minutes, studies have shown the quantity of particles that pass through the filter during this time can be greater than the rest of the filter run combined. Typical practice currently is to filter to waste during this time. North Battleford now does this but did not have this capability during the event [contamination of

> 2001]. The second stage is the normal operating time period where if the coagulation process is optimized, the filter will effectively remove small particles. This stage typically lasts between 10 to 78 hours, but can be quite variable so close monitoring is required. As the pore spaces in the filter become clogged with particles the final stage of particle breakthrough occurs. It is important that the filter run is stopped prior to significant particle breakthrough. The time of breakthrough can only be determined by monitoring turbidity on the individual filter. As a minimum, the filter run should be stopped prior to the turbidity reaching the regulatory requirement with normal practice being that it would be stopped at some value which is less than the regulatory requirement to give a margin of safety.

Dr. Stanley indicated the capable plant model was developed through work done by the American Waterworks Association Research Foundation (AWARF) in the late 1980s. The model was developed in response to new US EPA regulations that were promulgated in 1989 to help utilities assess and determine the factors important in producing good quality water, and to assist them to meet the guidelines. AWARF is an organization made up of major utilities from across North America and has a number of members from Europe and Australia. Any utility may join. Any member utility is given access to all information produced through AWARF.

The design and complexity of a water treatment plant will depend on the volume of water required by the community, and the source of the raw water that is to be treated. No single type of plant would be considered a capable plant for all types of surface waters. The characteristics of the plant are dependent on the raw water sources. In general terms, if the raw water source has turbidities that do or can exceed 5 NTU, a capable plant would have to have a clarification process in addition to its filtration and disinfection processes. Flow rates for which the plant is designed must be adhered to, and the emphasis should always be on the quality of water produced, not the quantity. In periods of peak demand, or in periods when the plant is challenged in some respect, tension can develop between the requirements for a certain volume of water and the ability of the plant to safely produce it. In no circumstances should the quality objectives which have been set for the plant be exceeded.

Dr. Stanley indicated that for smaller communities dealing with complex raw water sources, one of the more useful plant designs is to provide for off-line storage. This allows the plant to store water during periods when the raw water source is of acceptable quality, and allows for pre-sedimentation, both of which result in a more consistent raw water quality. More consistent raw water quality places less of a burden on the operator of the plant who must rely on experience when faced with the necessity of continuously changing chemical dosages in response to changing raw water conditions. The City of Lloydminster, which is also located on the North Saskatchewan River, has such a system. The City of North Battleford does not.

With respect to the operation of a plant, it is important to not simply rely on the end-treated water to determine how well the plant is operating. In a typical plant it is three to five hours from the time the water comes into the plant to the time it leaves the clearwell for the distribution system. If raw water changes require adjustment to the chemical dosages injected at the front end of the treatment process, the capability to intermediately assess the results of such changes should exist.

Therefore, in a capable plant, the raw water is monitored as it enters the plant, changes taking place in the raw water are noted, and chemical dosages are adjusted appropriately. Thereafter, it is important to monitor the turbidity of the water leaving the clarifier in order to ensure that too great a load is not being placed on the filters. Thereafter, it is in turn important to monitor the filters to both determine the performance of the filter and to ensure that the final turbidity of the water entering the clearwell meets the plant's objectives.

There are three methods of monitoring filters that can be utilized, although not all three are required in every plant. Filters can be measured for head loss, which measures the flow of water through the filters. The purpose of the measurement is to determine when the filters should be backwashed to clear out the buildup of particles in the filters. The second measuring device is the turbidimeter, which is required to determine if the final treated water entering the clearwell achieves the turbidity requirements imposed by the license or by the regulations. A third measuring device involves particle counters which will inform on the number and size of particles in the water leaving the filters. These particle counters are usually only utilized for plants attempting to achieve a final turbidity reading of 0.03 NTU or less. Mr. Bruce Clark, the laboratory coordinator of environmental compliance with the City of Saskatoon water utility testified that the Saskatoon water utility achieves turbidities of 0.06 and 0.09 on a routine basis. The utility uses particle counters primarily to track the number of particles leaving filters within the 2-15 micron range, which is the parasitic range. He indicated that at the low turbidity levels being achieved in Saskatoon, particle counts can double without any change in turbidity reading. The plant has a protocol for how many particles in the indicated range may be present in water leaving the filters. If that limit is exceeded the filter is shut down.

It follows from the foregoing monitoring requirements that a capable plant should have proper process control systems to monitor performance. An automated control system is far superior to one in which the operator has to personally check each monitor on some type of scheduled basis, such as once an hour, for the simple reason that automated systems can have alarms programmed to sound whenever the monitored parameters are exceeded. The City of Prince Albert water utility has such an automated system, installed since approximately 1996.

A capable plant should have the ability to run water to waste whenever the parameters of performance are exceeded, or cannot be immediately determined. Upon startup of the plant, the clarifier will take some time before the coagulation-flocculation-sedimentation process is optimized. Until the turbidity of the water leaving the clarifier can be determined to be within an acceptable range, the water from the clarifier should be run to waste. After backwashing of filters, research establishes that it will take 15-30 minutes for filters to ripen to the point that breakthroughs do not occur and the filtering process is optimized. Again, the water should be run to waste in the interval. Finally, water should be run to waste whenever the turbidity measures for water leaving the clarifier or the filters exceeds the established parameters. Dr. Stanley estimated that 90% of the water sent to waste in the Edmonton utility was due to particulate removal parameters being exceeded in the 2-15 micron range as determined by the particle counters. The reason for wasting the water is directly related to the concern about *Giardia lamblia* and *Cryptosporidium parvum*.

Each plant should maintain an appropriate maintenance schedule for all equipment, which should be performed when the raw water source is at its best, and the demand for water is not at its peak. Dr. Stanley indicated that EPCOR in Edmonton schedules all major maintenance for the winter months ending February 15th each year. During this period the turbidity in the North Saskatchewan River is very low and the demand for water is considerably less than during the summer months. In order that the treatment plant will always be able to meet the expected demand for water, certain redundancies may have to be built into the plant to allow the taking out of service of critical components due to unexpected maintenance reasons, the clarifiers and the filters, for example. Chlorination equipment which is fundamental in the treatment process is an area where duplicate equipment should be available.

The physical capabilities of a plant are not alone capable of producing safe drinking water. What is required in addition is a commitment from senior management, and in the case of municipalities, from city council, to the goal of producing safe drinking water.

Part of the administration component of operations of a water treatment plant is to have good quality assurance and quality control programs in place. Dr. Stanley identified three major components to such programs. They should:

(a) establish the parameters and frequency of testing;

(b) ensure that sampling and test results are accurate; and

(c) ensure that the operations staff has the appropriate expertise and that funding exists to provide ongoing training for staff.

Establishing the parameters for testing means determining what will be sampled or tested, including turbidity, particle counts, and chlorine levels. The frequency of testing, however, is equally important. The point is made that testing chlorine levels once a month does not provide assurance that on an ongoing basis the water quality meets the requirements for free chlorine and chlorine residuals.

Ensuring that sampling and test results are accurate, and that a chlorine residual is in fact one milligram per litre, and a turbidity reading is in fact 0.5 NTU, requires that testing equipment be regularly calibrated where appropriate to do so. In the case of samples, the process of split samples, grab samples, and third party sampling should be utilized.

Quality assurance requires that protocols be in place that will not only spell out the obligations of operators, and the parameters within which the plant should operate, but also specify what should take place if any of the parameters established in the protocols are exceeded. A protocol should exist to establish what type of testing be done and the frequency of the same, what type of record keeping is required, when water is to be run to waste, and most importantly, when the plant should be shut down. The protocol should establish who needs to be notified in the event the plant is challenged in some respect, or water has entered the distribution system that does not meet specified standards. Parties normally notified include senior management of the utility, the provincial regulator, the municipality, and the public health officials. In no case should operators be given the discretion to ignore or not follow a protocol.

Finally, there needs to be an appropriate level of review to ensure that all quality assurance and quality control programs are in fact being followed.

To the extent that there is cost involved in upgrading a water treatment plant to a capable level, Dr. Stanley points out that the actual cost of distribution of the treated water is usually a greater percentage of the total drinking water cost than are the treatment processes. The underground pipe system required for distribution with the ongoing maintenance and replacement obligations, together with the reservoirs and pumps and cost of electricity to pump the water, are incurred irrespective of the quality of the water being distributed. The point is made that a 25-30% increase in the costs of the treatment processes do not translate into an equivalent percentage increase in cost to the taxpayer.

A final point made by Dr. Stanley is that the regulatory process in North America, and probably worldwide, cannot always react to all of the information out there in the drinking water industry. It is therefore important for persons operating a capable plant to look at accepted standards in the water industry, as reflected in the practices of other capable plants. A capable plant has the obligation to change as standards change based on new information and new technology. The failure of a plant to do so may result in what was once a capable plant ceasing to be so at a later time.

PART II - THE NORTH BATTLEFORD PLANTS DEPARTMENT

The plants department of the City of North Battleford operates the city's sewage treatment plant, the surface water treatment plant, the ground water treatment plant, and the water distribution system and reservoirs. The department is under the direct supervision of a foreman who reports to the city's director of public works and engineering. There are eight operators in the department who interchangeably operate all of the facilities and also conduct most of the maintenance.

The description of the physical plants and water distribution system referred to in the following is taken largely from the evidence of Mr. Rodger McDonald, P. Eng., who has acted as a consultant to the City of North Battleford since the events of March and April, 2001.

1. Sewage Treatment Plant

The sewage treatment plant is a mechanical plant which can be called an activated sludge plant, or a primary/secondary treatment facility. The basic facilities at the plant were constructed in 1957. There were a number of additions between 1957 and 1991/92. The original plant was a primary treatment plant with an anaerobic digester and a trickling filter. In the 1970s it was decided to get rid of the trickling filter and replace it with an activated sludge system, with an aero accelerator system, and another final clarifier. In 1972 a chlorinator was installed. In the latter part of the 1970s another anaerobic digester was installed. In 1990/91 a new primary clarifier was added. Subsequently, a chlorine contact chamber was added.

The main objectives for the North Battleford sewage plant are the removal of solids and floating materials, and a reduction in decomposable organic substances. The raw wastewater comes into an initial collection manhole and from there it is delivered by gravity to the plant where it passes through a bar screen used to collect rags and large objects. Next comes a grit removal system which takes out some of the sand. It then passes through communuters that grind objects that pass through the first two barriers. From the bar screen the waste is split into channels. Part of the wastewater goes into rectangular primary clarifiers that have been there since 1957, and the rest goes into the new primary clarifier, constructed in the early 1990s. The clarifiers are primary settling tanks. From here the clarified water from the primary system is sent to secondary treatment that involves an aero accelerator configuration. Essentially, the wastewater is aerated and agitated. The water from the aero accelerator then goes to a final clarifier that acts as a sedimentation basin. Finally, the water undergoes a disinfection process, passing through a chlorine contact chamber, and is then discharged out of the plant into the river. The capacity of the sewage treatment plant is 5,455 to 5,910 litres per minute. The flow rate into the sewage treatment plant will vary over the course of a normal day down to approximately 1,818 litres per minute during a less active part of the day and, perhaps, up to 4,546 litres per minute during more active parts of the day.

The city maintains one set of pipes for the sewage system, and a separate series of pipes for storm water. The storm water system consists of one major discharge point adjacent to the sewage treatment plant and three lesser discharge points. The outfall of the treated effluent from the sewage treatment plant goes into the same channel as the main storm sewer discharge.

In periods of heavy rainfall or in heavy spring runoff, storm water can enter into the sanitary sewer system and increase volumes beyond the capacity of the plant. If the runoff is in excess of the capacity of the storm water system, the streets may become flooded, which in turn will flood the manholes for the sanitary system. If there is an excess inflow into the sewer plant, water will rise in the collection manhole that has a weir. Once water entering the manhole reaches a certain volume it will automatically flow over the weir and go into a bypass channel that avoids the plant's treatment processes. The bypass sewage and the treated effluent from the chlorine contact chamber, which is the final disinfecting process in the plant, join in a single pipe which then flows into the North Saskatchewan River. There is an effluent flow meter on this pipe. The only treatment the sewage which bypasses the plant receives is some chlorination when it meets up with the effluent from the plant in the same pipe. The inquiry was told that these bypasses might occur, on average, twice a year. The evidence was, however, that no such bypass had occurred in the three months immediately prior to April, 2001.

The sewage treatment plant does not have specific effluent quality requirements. The initial aero accelerator unit was supposed to achieve approximately a 90% treatment performance, or biochemical oxygen demand (BOD). The BOD is a measure of the amount of biodegradable organic material and can have an impact on the dissolved oxygen regime of the water. If the number is too high, then organisms will try to assimilate or degrade this material and may use up more oxygen than the river is able to provide. This will have an impact on aquatic life.

The most recent permit for municipal sewage effluent for the plant was dated December 18, 1996, and had an expiry date of October 31, 1998. On September 25, 1998, Mr. Scott Meekma, SERM's Parkland EcoRegion environment officer for the Battlefords' area, wrote to Mr. Robert Berry, P. Eng., director of public works for the City of North Battleford and extended the permit to October 31, 1999, in order to allow further consultation with respect to recommendations in a report dated January, 1997, commissioned by the City of North Battleford and prepared by Reid Crowther and Partners Ltd. The letter suggested a meeting by the third week of November, 1998. On November 30, 1999, Mr. Meekma wrote again, this time to Mr. Randall

Strelioff, the new director of public works and engineering for the city, and extended the permit to October 31, 2001. Mr. Meekma noted the reason for the extension was to allow new personnel involved in the city administration to become familiar with the history of the sewage plant and the recommendations contained in the Reid Crowther report. This letter concluded that he would contact Mr. Strelioff in May, 2000, to discuss the city's plans. Mr. Meekma testified that following the water contamination event in Walkerton, Ontario in April of 2000, he became extremely busy with water issues in a number of communities and he did not follow up on the request for the May meeting. A meeting did not occur prior to the *Cryptosporidium parvum* outbreak in North Battleford in April, 2001.

The terms and conditions of the permit require the city to chlorinate effluent from the plant sufficient to achieve a chlorine residual of not less than 0.5 milligrams per litre after a minimum of 15 minutes of contact time. The permit outlines the records that are to be maintained by the plant and the sampling that is to be performed. Article 3 specifies:

> 3. The city shall collect samples of raw sewage, effluent and receiving water at the following locations and times:
>
> (a) the effluent discharged from the sewage treatment plant at least once every three months (SERM Station No. 52940).
>
> (b) the North Saskatchewan River at Highway No. 16 crossing at least once every three months (SERM Station No. 3700).
>
> (c) the North Saskatchewan River at the raw water intake to Water Treatment Plant No. 2 at least once very three months (SERM Station No. 4024).
>
> (d) the North Saskatchewan River at the raw water intake to Water Treatment Plant No. 2 at least once every two weeks for total and fecal coliform bacteria (SERM Station No. 4024).

The balance of the permit indicates what the samples are to be analyzed for in each case and requires the results of the analysis to be forwarded to

SERM's environmental protection branch within 60 days of obtaining the information. It will be noted from the foregoing there are no regulatory limits on the sewage effluent other than the maintenance of the chlorine residual outlined.

The operators who testified at the inquiry indicated that the sewage treatment plant, which operates 24 hours a day, is very labour intensive. It is a very old plant with very old equipment, and therefore is very high maintenance. In addition, the chlorine shed is separated from the main building and this requires an operator to leave the plant to check on the chlorine from time to time to determine if it is going to run out. The operators have been concerned about the state of the equipment in this building for a number of years, and have also questioned the structural integrity of the building. From time to time the operators have also questioned the quality of the sewage effluent entering the North Saskatchewan River.

The evidence indicated that the location of the sewage treatment plant upstream from the raw water intake for the surface water plant has been a source of concern for many years.

Examples submitted to the inquiry of correspondence between the provincial regulator and the City of North Battleford indicate the province was concerned with the quality of effluent from the sewage treatment plant dating back to at least 1963. In a letter dated December 28, 1967, the regulator wrote to the city and stated in part:

> A recent river survey conducted on the North Saskatchewan River indicated a coliform bacteria count, expressed as Most Probable Number (MPN) per 100 millilitres, upstream of the sewage outfall of less than 3 while a sample taken from the intake of the hospital water treatment plant contained 24,000 organisms per 100 mls. On March 22 of this year a value of 24,000 was also obtained on a sample from the plant intake.
>
> Although the hospital plant [surface water treatment plant no. 2] provides complete treatment including a relatively high degree of chlorination it is not considered desirable to have to rely solely on this facility to produce a water safe for human consumption. Improvement of the raw water quality by lowering the level of bacterial contamination is a necessity.

This could possibly be achieved by the following three alternatives:

(1) Lagooning of treatment plant effluent.

(2) Piping effluent to the far side of river channel.

(3) Chlorination of treated effluent.

Without detailing specifics, the city introduced several interim changes intended to reduce the impact of sewage effluent entering the North Saskatchewan River. On April 3, 1968, the regulator wrote to say:

> We were rather surprised to find the coliform count so high since it is much the same as previous samples taken before changes were made in the manner of sewage effluent disposal. From this one result it would appear effluent is still reaching the river channel from which the intake draws water.
> [emphasis added]

In a letter dated January 30, 1969, the regulator noted that in a sample of raw water from the surface water treatment plant taken on January 20, 1969, total coliforms measured 43,000 MPN per 100 millilitres and fecal coliform 24,000 MPN per 100 millilitres. The letter requested more frequent testing. In a letter dated April 30, 1969, the regulator concluded:

> While bacteriological tests conducted on the treated water at the plant have been satisfactory we feel the situation is potentially very dangerous, particularly if the chlorination equipment should ever fail. After considering all factors we wish to advise council that we will be unable to recommend to the Commission that approval to operate the sewage works be extended beyond February 1, 1970, unless remedial action is taken this year. The only other alternative, which we feel certain council would not wish to consider, would be to shut down the number two water plant unless the raw water quality is considered suitable for treatment.
> [emphasis added]

It will be noted the regulator was prepared to enforce its policy by closing down the sewage treatment plant unless remedial action was forthwith taken. This is the last indication in the correspondence of the regulator's willingness to attempt to enforce a policy on the city with respect to its sewage treatment plant.

A report prepared by consulting engineers retained by the city and dated September 18, 1969, concluded the deficiencies in sewage treatment were due to overloading of the existing plant rather than failure of portions of the plant to operate as intended. The report recommended a program of expansion for the plant which was carried out in the years 1971/72. In 1980, further additions and modifications to the sewage treatment plant were made. On April 28, 1980, the plant received a five-year permit. The letter accompanying the permit stated in part as follows:

> [I]n this regard your attention is drawn to the condition of the approval pertaining to tests, records and reporting. Adherence to these aspects has been less than satisfactory in the past.

In a letter dated May 2, 1985, extending the sewage treatment plant permit to December 15, 1987, the regulator noted:

> The sewage treatment plant appears to provide an adequate secondary level of treatment for the current population.
>
> Compliance with the monitoring requirements during the term of the previous approval ... has been satisfactory.

On November 25, 1987, the regulator wrote to the city and stated in part:

> In June, 1987, revised regulations were enacted requiring all sewage works to produce a secondary effluent as a minimum level of treatment rather than a primary effluent or alternatively utilize adequately sized facultative lagoons. Based on available data, the City is at present not meeting secondary treatment levels; probably due to overloading of the existing facility.

The city replied, in a letter dated December 14, 1987, indicating that plans to upgrade the sewage treatment plant were in progress, and that construction would proceed in 1988. The upgrade to the sewage treatment plant was not completed until 1991.

In a letter dated January 20, 1993, the regulator wrote to the city to say it had reviewed the city's sewage effluent data for the years 1990, 1991, and 1992, for the purpose of evaluating the performance of the expanded sewage treatment facility built in 1990/91. The letter stated:

> The summary clearly indicates that there has been little improvement in the effluent quality and the effluent does not meet the regulatory requirement for a secondary treated effluent. The City should remain concerned at the occasional high bacterial populations entering the water treatment plant. City sampling data indicates that the sewage effluent bacteriological quality still does not meet our guideline values for disinfected effluents of 2500 total coliforms per 100 ml and 200 fecal coliforms per 100 ml.
> [emphasis added]
>
> ...
>
> [I]n view of the poor plant performance we request that the city undertake the sewage treatment study in 1993 rather than 1994.

On April 12, 1993, Mr. Plumber, then director of public works and utilities, replied to the foregoing letter. He stated in part:

> We agree that the improvements completed 21 September, 1991 have not brought about the expected effluent improvement.
>
> ...
>
> We are very cognizant of the effect of poor sewage effluent quality on the No. 2 water treatment plant. It is in our own best interests to have both systems operating properly. We ask that your request for a sewage treatment plant study in 1993 be postponed until the primary clarifier is operating satisfactorily.

It appears from the foregoing that both the regulator and the city in 1993 agreed that effluent from the sewage treatment plant was on occasion reaching the raw water intake of the surface water treatment plant.

The following year, in a letter dated January 13, 1994, the regulator wrote to the city and stated in part as follows:

> We were pleased to note the improved effluent quality in terms of BOD and TSS during the late June to November period. The improved performance according to your staff resulted from the City evaluating use of alum and polymer to chemically assist primary clarification. Since only several months of performance data was available, we indicated that this evaluation should continue over this winter and next summer period. Recent City data indicates that plant performance has suffered during December. We do not know if this is due to colder sewage temperature, inadequate sludge removal or if chemical additions have ceased. Average BOD and TSS for December were 74 mg/L and 46 mg/L respectively, an increase from 32 mg/L for both BOD and TSS during the July through November period.
>
> ...
>
> [A]lthough we do not have a lot of final effluent bacteriological data since the chlorine contact chamber became operational, available data indicates effluent disinfection has generally been poor. We note river samples obtained at the water treatment plant on March 10, 1993 had measured fecal coliform levels of 150,000 per 100 ml. This indicates an extremely contaminated water and demonstrates the importance of insuring good bacterial reduction in the effluent. We remain concerned with the apparent poor performance of the effluent disinfection process and would appreciate receiving your comments on its resolution. Increasing the chlorine dosage rate may be necessary to obtain adequate disinfection, particularly if poor suspended solids removal is being experienced.
> [emphasis added]
>
> We request that you inform us at an early date, but no later than March 31, 1994 on the City's plans and schedule for instituting sludge transfer facilities from the new clarifier, the schedule for the sewage treatment study, and your plans for continued evaluation of the sewage treatment plant performance.

In a letter dated November 27, 1996, the regulator noted in part:

> Monitoring results indicate that the effluent quality has improved since our last review on December 13, 1995.
>
> ...
>
> Bacteriological quality for 1996 exceeded the raw water objective of 5000 total coliforms per 100 ml to date only once. This occurred on June 25 with a total coliform count of 24,000 per 100 ml being recorded. The objective was exceeded four times during 1995.
>
> We commend the city for their effort in addressing the treatment concerns observed during the 1995 operating year and returning the plant to the 1994 operating efficiency level.

In 1995 Reid Crowther and Partners Ltd. were retained by the city to review and report on the state of the sewage treatment plant. The final report was delivered to the city on January 23, 1997. At page 3-29, under the heading "Audit Conclusions," the report states:

> The primary conclusions to be drawn from the audit are as follows:
>
> 1. Treated effluent often exceeds the license limits imposed by Saskatchewan Environment. Data reviewed between 1990 and 1995 indicate that poor treatment performance has plagued the plant. Operation however has improved since 1994 when alum dosing was initiated.
>
> 2. Untreated wastewater is by-passed around the plant during high flow events. A review of plant flow data indicates that by-passing occurs primarily during spring run-off and summer storm events when high inflow adds to the base wastewater contribution. Whether Saskatchewan Environment will tolerate by-passing in the future needs to be determined.
>
> 3. Many of the plant's processes suffer from outdated technology and unconventional process configurations. Many of these problems were

highlighted in previous sections and will not be repeated here. They have made it difficult for the plant operators to run the plant in a stable manner.

4. There exist significant health and safety concerns that should be addressed. Of immediate concern is the high hydrogen sulphide concentration measured in the area of the primary sludge well when sludge is being pumped. We understand that the City has addressed this problem. The chlorination building needs to be modified so that if a leak should develop no one will get hurt. Consideration should be given to upgrading the digester gas system to comply with the current applicable code. The health and safety risks associated with the headworks area should also be addressed in some manner.

5. Instrumentation and controls are primitive by today's standards. Installing appropriate instrumentation and controls will reduce labour requirements significantly and reduce operator exposure to some of the health and safety risks at the plant.

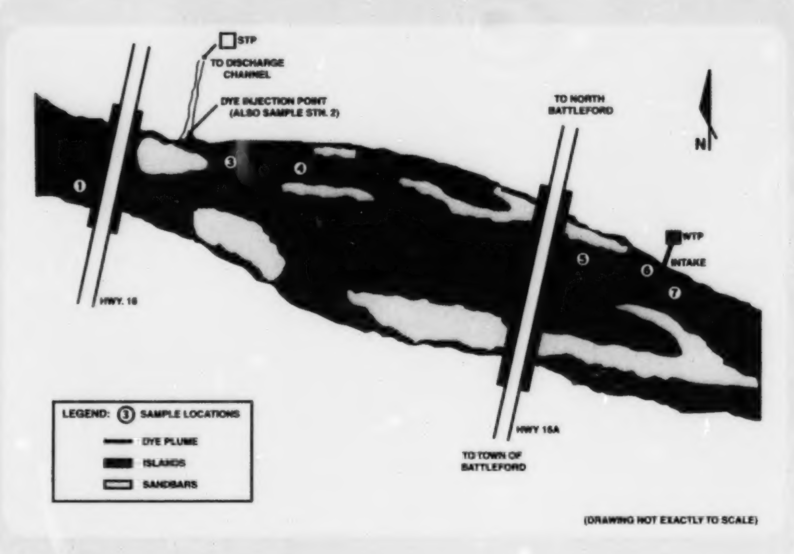
6. Retrofitting the existing facility to meet new effluent regulations will be difficult on the existing site. A serious look at the benefits afforded in relocating the plant to a new site should be made.

In closing, credit must be given to the operators for managing to operate such a difficult plant. They have managed to make a system work surprisingly well considering the outdated technology and unconventional plant configuration.

As of April, 2001, the foregoing report had not been acted upon.

In 1989, and again on September 29, 1992, the environmental protection branch of SERM conducted dye studies to track the effluent emerging from the North Battleford sewage treatment plant. The method chosen was to inject dye on a continuous basis at the discharge point into the river and observe the flow plume of the discharged effluent. These studies showed the effluent traversed the river and tended to hug the north side of Findlayson Island in the middle of the river and thereafter flow past the raw water intake for the surface water plant. The personnel who conducted the test were not able to observe effluent at the water intake point.

Fig. 4
NORTH SASKATCHEWAN RIVER SHOWING FINDLAYSON ISLAND


STP
TO DISCHARGE CHANNEL
DYE INJECTION POINT (ALSO SAMPLE STN. 2)
TO NORTH BATTLEFORD
N
①
③
④
⑤
⑥
⑦
WTP
INTAKE
HWY. 16
HWY 16A
TO TOWN OF BATTLEFORD
LEGEND: ③ SAMPLE LOCATIONS
DYE PLUME
ISLANDS
SANDBARS
(DRAWING NOT EXACTLY TO SCALE)

Source: Government of Saskatchewan
Water Quality Branch
North Battleford Mixing Zone Study 1992
Exhibit C-106 Tab C3

Dr. Stanley, in his testimony, pointed out that the results of such a "slug" test performed with respect to the North Battleford sewage effluent may very well differ from the testing of a continuous discharge. Dr. Stanley made the point that he did not doubt the results obtained by SERM with respect to the dye tests it conducted. However, he pointed out that this was only half the story. In view of the fact the effluent from the sewage plant is a continuous discharge, and assuming it flowed in the manner indicated by the test, the result is that the water hugging the north side of Findlayson Island is always full of effluent, which will in effect create a barrier for the upstream water flowing through the area so that the upstream water will go around the effluent barrier and there will be leakage from the barrier into the area which includes the raw water intake for the surface water plant. Dr. Stanley went on to say that if the test was conducted over several days and a fluorescent dye was used to allow for measurement of the fluorescence even in very low concentrations, the concentration of effluent would be very high and very close to what is in the plume. He emphasized, however, that the concentrations of effluent would be relatively low, because of the dilution effect of the river on the effluent both in the plume and elsewhere.

One of the operators testified that, while he understood that sewage effluent is supposed to go to the far side of the river, he had observed there is a channel from the far side that brings the effluent back into the faster flowing part of the river toward the location of the raw water intake for the surface water plant.

From 1994 to 1999, Mr. Ivan Katzell, the plants foreman, sampled the river water where it enters the raw water intake for the surface water treatment plant. The test program was stopped in 1999 when the director of public works and utilities decided that five years of sampling was a long enough period to establish baseline data. The samples taken during this period were sent to the provincial laboratory and tested for total coliforms and fecal coliforms.

As a result of this test program Mr. Katzell concluded that sewage treatment plant effluent was affecting the quality of water at the intake to the surface water treatment plant at times. The problem was that it was not possible to predict when this would occur. When high coliform counts were analyzed, the results would not come back for four or five days. In consequence, the operation of the surface water treatment plant was not based in any way on the results of Mr. Katzell's sampling program.

Since April, 2001, the city has commissioned a site study for a new sewage treatment plant, and is in the process of putting together a financial package including existing utility reserves, water and wastewater utility infrastructure fees, government grants, and borrowing for construction of a new sewage treatment plant. At the time of the hearings there was no firm start date for such construction.

On the basis of the foregoing it is evident the flow of the North Saskatchewan River does shift from time to time, and at least some of the time effluent from the sewage treatment plant does pass over the raw water intake of the surface water plant.

FINDINGS

8. Effluent from the sewage treatment plant upstream from the surface water treatment plant does pass over the raw water intake of the surface water plant, at least some of the time.

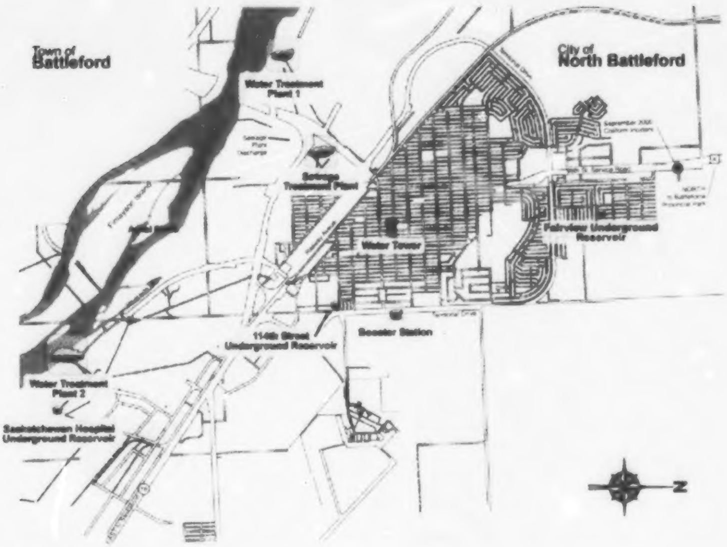
9. Due to the shifting flows in the North Saskatchewan River, it is not possible to predict when sewage effluent will find its way to the raw water intake for the surface water treatment plant.

RECOMMENDATIONS

2. **That the City of North Battleford commence construction for a new sewage treatment plant at a location downstream from the surface water treatment plant by no later than the spring of 2003.**

2. Water Distribution System

Fig. 5
CITY OF NORTH BATTLEFORD
WATER DISTRIBUTION SYSTEM


Town of Battleford
Water Treatment Plant 1
Sewage Treatment Plant
City of North Battleford
Water Tower
Fairview Underground Reservoir
Booster Station
114th Street Underground Reservoir
Water Treatment Plant 2
Saskatchewan Hospital Underground Reservoir
N

Source: City of North Battleford
Flash Micromedia CD-Rom
Exhibit C-4

As will be observed from the foregoing diagram of the water distribution system, water treatment plant No.1, which is the ground water plant, is located upstream to the west of the sewage treatment plant, and water treatment plant No. 2, which is the surface water plant, is located downstream to the east of the sewage treatment plant. In addition, there are four reservoirs that form part of the water distribution system; the water tower, the Fairview underground reservoir, the 114th Street underground reservoir, and the Saskatchewan Hospital underground reservoir.

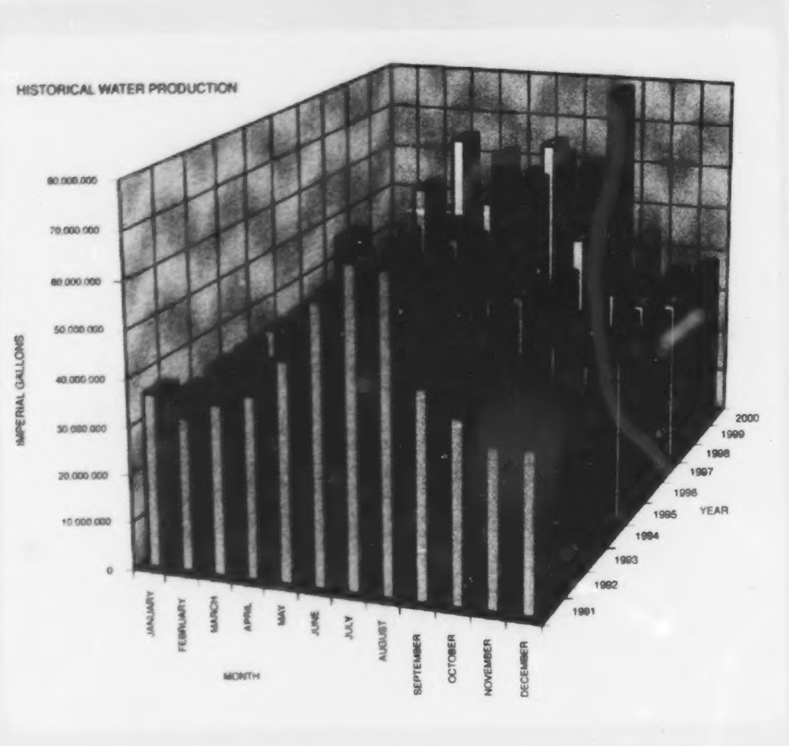
The ground water plant primarily serves the north and west portions of the city. The surface water plant supplies the east and northeast portions of the city as well as the Saskatchewan Hospital. The areas serviced nearest to each water treatment plant receive the water which emanates from that plant. However, once the treated water reaches a reservoir, the water from both plants is mixed. With the exception of the Saskatchewan Hospital reservoir, which is exclusively serviced by the surface water treatment plant, the balance of the reservoirs are interconnected by pipe. The water levels in all three of these reservoirs are remotely available to operators from a console at the sewage treatment plant.

The water tower is the most important reservoir and acts as both a storage facility and as a pressure device, or surge tank. Unlike the other reservoirs, no repumping is required for water leaving the tower. The operational guidelines for the tower are to maintain a water level between 10 and 25 feet, and in any event to keep the water level in the tower above the bottom of the base. The hours of operation at the surface water treatment plant are largely contingent on the water level in the tower. For example, if the water tower is full it may not be necessary to operate the surface water plant that day. The plant operators testified that upon commencing a shift at the surface water treatment plant, their first task was to check the water level in the tower. This would inform the operator on how much water was needed and how quickly water should be released from the surface water treatment plant.

The demand for water during the summer months greatly exceeds the demand in the winter months. The flow from the surface water plant in the winter averages 4,546 to 5,910 litres per minute. In the summertime it is up to 7,205 litres per minute. In the winter, this plant is operated during the daytime only. In the summer it is operated up to 24 hours per day.

Fig. 6

CITY OF NORTH BATTLEFORD
HISTORICAL WATER PRODUCTION BY VOLUME



Source: City of North Battleford
Flash Micromedia CD-Rom
Exhibit C-4

The Fairview reservoir holds 4,546,000 litres, and it supplies water during peak demand. Prior to March, 2001, there was no chlorination capability at the Fairview reservoir.

The 114th Street reservoir holds 3,409,500 litres. It obtains its water from the surface water plant. The water in this reservoir is used to ensure a reserve of water for fire protection purposes. Water could remain in this reservoir for a number of days. Prior to April, 2001, this reservoir was on manual operation, meaning that to fill it or pump it required an operator to physically manipulate the valves.

The 114th reservoir and the Fairview reservoir are both served by a single pipe, with the result that simultaneous filling and pumping of either reservoir is not possible.

The Saskatchewan Hospital reservoir serves only the Saskatchewan Hospital, and the water for this reservoir comes exclusively from the surface water treatment plant.

The water distribution pipes throughout the system are subject to periodic flushing (usually done in connection with the testing of fire hydrants) and swabbing, which involves the insertion of a foam under pressure for the purpose of cleaning the interior of the pipes.

Prior to September, 2000, the city's permit required that five sites in the distribution system be tested for bacteria three times a week. The bacteria samples were sent to the provincial laboratory in Regina, accompanied by a form containing provision for the recording of a turbidity measurement and a chlorine residual measurement with respect to the sample. Prior to September, 2000, this sampling was conducted largely by the plants department operators and, in particular, the foreman, Mr. Katzell. Following September, 2000, the sampling was increased to 15 sites and was thereafter performed by the city engineering department technicians.

3. Ground Water Plant

The ground water plant is not implicated in the *Cryptosporidium parvum* outbreak of 2001. This plant, however, has some relevance as its water mixes with the water from the surface water plant in the water distribution system. This fact in turn led to management of the plants department making certain decisions with respect to chlorination of the treated water, to be reviewed later.

Constructed in the 1940s, the ground water plant is the oldest treatment plant in the city. Since that time there have been additions to the plant. The ground water plant operates 24 hours per day. The plant has a variable flow rate ranging from 2,273 litres to 5,455 litres per minute, depending on water demand and the output from the ground water supply. Recently, production has been at the lower end of this range. Historically, the plant produced approximately 75% of the city's water. In the year 2000 it was down to 55%.

The decline in the percentage of water from the ground water plant is attributed to the fact that maintenance practices have slipped with respect to the wells. These are susceptible to biofouling occasioned by iron bacteria and organisms of that nature, and as a result of the screens becoming plugged. Mr. Katzell testified that the wells could not be restored to their original volume using the maintenance program in place. Prior to 2001, the last wells were drilled in 1995.

In March, 2001, there were nine wells in production, largely located along the river upstream from the ground water plant. These wells discharge into a common header pipe that leads to the plant. The temperature of the ground water is relatively constant, as is its alkalinity. Ground water flows through a fine porous media that acts as a natural filtering system, and in consequence is not subject to excess turbidity and other problems associated with surface water. *Giardia lamblia* and *Cryptosporidium parvum* are normally not a concern with respect to a ground water source, and usually only become a problem if the ground water source is contaminated by surface water or runoff or in some other way.

Water entering the plant from the well field is distributed to four pressure filters, 8-10 feet in diameter. The upper section of these filters consists of lava rock, which is a porous medium, and below this is sand. The main treatment offered in the plant, apart from chlorination, is iron removal. This is

Fig. 7
CITY OF NORTH BATTLEFORD WATER PRODUCTION AND WATER RATES (1989 to 2001)

	FE Holliday Plant (Imp Gallons)	WTP #1 (Imp Gallons)	Total (Imp Gallons)	Total Meters^3	Utility System Total Billed Meters^3	Dept. Water Billed		% Not Billed
1989	155,730,660	381,304,500	537,035,160	2,441,069	2,061,686	191,041	2,252,727	8%
1990	96,525,540	404,714,600	501,240,140	2,278,364	1,911,183	177,688	2,088,851	9%
1991	93,562,740	412,402,200	505,964,940	2,299,841	2,007,110	180,640	2,187,750	5%
1992	74,477,420	404,701,000	479,178,420	2,178,084	1,928,325	175,845	2,104,170	4%
1993	37,114,600	408,545,300	445,659,900	2,025,727	1,793,342	146,632	1,939,974	4%
1994	131,081,600	367,192,400	498,274,000	2,264,882	2,008,543	190,500	2,199,043	3%
1995	161,908,700	332,895,800	494,804,500	2,249,111	1,988,458	155,763	2,144,221	5%
1996	79,923,080	404,008,400	483,931,480	2,199,689	1,867,452	146,807	2,014,259	9%
1997	128,915,600	371,913,000	500,828,600	2,276,494	1,870,244	143,289	2,013,533	13%
1998	180,484,360	310,889,300	533,765,660	2,426,208	2,041,284	195,218	2,236,502	8%
1999	118,211,020	344,790,100	463,001,120	2,104,551	1,904,611	99,603	2,004,214	5%
2000	250,741,900	296,495,300	547,237,200	2,487,442	1,978,791	133,154	2,111,945	18%
10 Year Average Yearly Production			495,264,582	2,251,203				

	Water Rates (per cubic meter)				Minimum water chg/mon	Sewer Charge % of water	Minimum Sewer/mon. Non-Res	Avg Res Increase
	first 100 m^3	next 400 m^3	next 2000 m^3	over 2500 m^3				
1990	0.70	0.59	0.48	0.37	3.50	56%	6.00	
1991	0.71	0.60	0.49	0.38	3.50	58%	6.00	2.74%
1992	0.72	0.61	0.50	0.39	3.60	60%	6.00	2.89%
1993	0.72	0.61	0.50	0.39	3.60	60%	6.00	
1994	0.73	0.62	0.51	0.40	4.00	60%	6.00	1.40%
1995	0.74	0.63	0.52	0.41	4.50	60%	6.00	1.37%
1996	0.74	0.63	0.52	0.41	4.50	60%	6.00	
1997	0.75	0.64	0.53	0.42	4.50	60%	6.00	1.35%
1998	0.75	0.64	0.53	0.42	4.50	60%	6.00	
1999	0.75	0.64	0.53	0.42	4.50	60%	6.00	
2000	0.75	0.64	0.53	0.42	4.50	60%	6.00	
2001	0.80	0.70	0.60	0.48	5.60	62%	6.50	8.00%

Source: City of North Battleford
Exhibit C-93 Tab 5

accomplished by injecting air up through the lava rock as the water falls against it. The purpose is to oxidize the soluble iron in the water into an insoluble form that will allow it to be filtered out. After this process the water passes through a filter media consisting primarily of sand and then moves on to the clearwells. The ground water is also high in manganese, so a sequestering agent (sodium tripolyphosphate) is added to the filtered water to hold in solution the manganese not removed by the treatment process. The water is chlorinated in the clearwells.

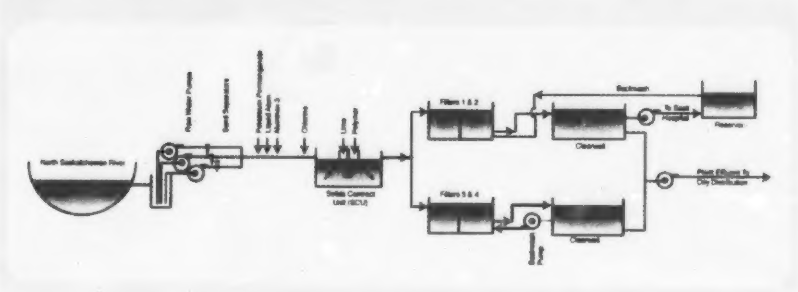
On occasion, turbidity values in the treated ground water can be slightly elevated but this is only of aesthetic concern and not a health concern. In the Canadian Guidelines, the 1 NTU turbidity MAC referred to is directed at the health concern. The 5 NTU referred to is the aesthetic objective. Thus 1 NTU is the MAC for water leaving the surface water plant for the distribution system, but within the system up to 5 NTU is an acceptable MAC according to the Guidelines. Turbidity testing of the treated ground water is done manually by the operators using benchtop testing equipment.

4. Surface Water Plant

(a) Physical Plant

The surface water treatment plant dates back to approximately 1950. It was constructed by the Department of Public Works of the Government of Saskatchewan to serve the Saskatchewan Hospital complex. In 1961 it was taken over by the City of North Battleford. In 1981 there was a major physical expansion to the building. At this time the original clarifier, called a hydro - treater, was taken out of service and the present solids contact unit (SCU) was installed. Two additional gravity filters were added to the two original filters, and an additional reservoir was added, all of which resulted in an increased capacity for the plant. In 1989 further modifications were made to the raw water intake, and the media in the original two filters was changed. New under-drains were installed at the same time.

Fig. 8
CITY OF NORTH BATTLEFORD
WATER TREATMENT PLANT NUMBER 2
PROCESS SCHEMATIC


North Saskatchewan River
Raw Water Pumps
Sand Separators
Chlorine
Lime
Polymer
Solids Contact Unit (SCU)
Filters 1 & 2
Filters 3 & 4
Clearwell
Clearwell
Backwash
To Sask Hospital
Reservoir
Plant Effluent to City Distribution

Source: City of North Battleford
Flash Micromedia CD-Rom
Exhibit C-4

Water from the North Saskatchewan River flows by gravity into a raw water well. There is an orifice meter on the raw water supply line where the flow rate is measured. Raw water flow rates are normally dictated by water demand and how well the filters are operating. The plant can safely be operated at a design flow rate of 120 litres per second. From the raw water well, water is pumped via vertical turbine pumps up through a sand separator. The water then flows into the SCU, from there to the filters, and then on to the clearwells.

Before reaching the SCU, certain chemicals are added to the water to aid the coagulation-flocculation-sedimentation process in the SCU. Alum (aluminum sulfate) is added to the water in liquid form as the primary coagulant. In the peak seasons between April and September, aluminex, which is a polyaluminum chloride, is added as an additional coagulant. Potassium permanganate is added as a pre-oxidant to help oxidize or break down organic materials and thereby reduce taste and odour problems. Prior to April, 2001, the only mixing that occurred with respect to these chemical additives before they entered the SCU was the normal mixing associated with flow in the pipe and its elbows. In other words there was no rapid mixing of these chemicals, which for many years has been recommended as an integral component of the coagulation-flocculation process.

Chlorine is the other major chemical added before the SCU. The plant has a chlorine room with two gas chlorinator units on-line. The changeover of cylinders is manual and requires two operators to be present. The rotometer on the chlorine feeders is adjusted manually. The advantages to adding chlorine at this early stage are that it assists in controlling biological growths in the SCU and in the filters, and it also increases the contact time for the chlorine to act as a disinfectant before the water goes out to distribution. The disadvantage is that one of the chlorimines generated by adding chlorine to the SCU is trihalomethane, which is potentially carcinogenic. The Canadian Drinking Water Guidelines specify a MAC for trihalomethanes. The permit for the surface water treatment plant requires two samples to be submitted to the provincial laboratory from two different locations in the distribution system every three months. The results of this testing indicate the trihalomethane MAC was exceeded on occasion.

The other chemicals added directly to the SCU are lime and a polymer. The lime is added as a slurry to restore the pH of the water, lowered as a result of the addition of acidic alum. With respect to pH levels, 7 is neutral. When the alkalinity falls below 7 it is more acidic and therefore more corrosive to the pipes in the distribution system. Above 7 the water is more alkaline and scale-forming, which can cause problems for plumbing and staining in households. Lime is also helpful in the coagulation-flocculation process. The dosage of lime is determined by the pH readings of the water in the SCU.

The polymer used is an anionic polymer that has a high molecular weight. Its purpose is to aid the flocculation process. It assists the agglomeration of particles and brings them together in a denser, tighter material that can be more readily settled. The dosage for polymer is based on the operator's observations with respect to flocculation performance in the SCU or by performing a settling test.

The SCU holds 681,900 litres of water. The raw water with the chemicals added enters the SCU from the side and towards the centre of the unit. The SCU's function is to accelerate the process. There is a shroud or baffle in the unit that directs the water downward where it mixes with the existing slurry pool in a primary reaction zone. An integral part of the SCU is an impeller turbine mixer that rotates and has a variable speed drive. Its purpose is to aid the coagulation and flocculation process in the SCU. From the primary reaction zone, the water goes upward through a secondary mixing and reaction zone. The flocculated water is pushed to the periphery from where it settles into the slurry pool. The clarified water separates and comes up through orifices in the radial collectors called launder tubes. From the launder tubes the water flows to the filters.

Sediment in the SCU collects around the periphery on the external side of skirts located in the unit. The unit has a blowoff system that can blow the sludge to waste in order to keep sediment from building up. The blowoff valves are operated manually and a timer can be set for a specified period of time.

The flocculation process should produce a size of floc that looks like dense fluff. If the floc being produced is very small in size, called pinpoint floc, it is a sign that the flocculation process is not working properly. This requires the operator to add more coagulant or otherwise adjust the process chemicals. The temperature of the water can have a profound effect on the coagulation process and for this reason the raw water temperature is measured by the operator. The colder the water, the more coagulation chemical is required.

Before April of 2001, the operators performed two types of bench test in the plant's laboratory to determine if the coagulation-flocculation process in the SCU was achieving satisfactory settlement in the historic 10-20% range.

A settling test requires the collection of a sample from the centre tube of the SCU, which is in the middle of the secondary reaction component containing the floc slurry. The test involves pouring a sample into a 1,000 millilitre graduated cylinder and determining the amount of settlement that occurs after five minutes. Ideally, the settling test should be performed on an hourly basis. The purpose of the test is to determine if the dosage of coagulants is working properly to achieve the desired settling. The test also determines if there is too much slurry in the pool and it is therefore time to release some sludge to waste.

The test tells the operator the size of the particulates, whether fine or larger, whether floc is rising to the top, and the colour of the floc. If there is pinpoint floc it suggests that there might be too much chemical in the water. The operator is looking for a larger floc that provides an even rate of settling. If the floc settles too quickly the concern is that it will not attach to the dirt in the water. Floc floating on top of the water is bad because it will no doubt contain some dirt and will proceed into the launder tubes and from there to the filters. The object is to see clear water at the top of the test cylinder, as this is the water that will be going from the SCU into the launder tube, and from there to the filters.

What is referred to as a jar test is performed by the operator when the settlement being achieved in the SCU is not satisfactory. This test is an attempt to simulate the processes of coagulation, flocculation, and sedimentation in a beaker. The operator can set up a series of beakers and test the effects of various dosages of chemicals incrementally on the coagulation-flocculation process. The plant's lab has an old paddle mixer with a speed control mechanism that allows the operator to simulate the slow mix flocculation stage. A jar test is also used on occasion for testing new chemicals and coagulants or coagulant aids. The evidence of the operators who testified is that jar testing was not a frequent occurrence.

From the SCU via the launder tubes, the water proceeds to the filters. As of April, 2001, there was no metering to determine the flow rate to either of the filter banks.

There are two filter banks in the plant, No. 1 & 2 and No. 3 & 4, which are of dual granular media consisting of anthracite overlaying sand. The anthracite is a slightly larger size (0.6-0.8 millimetres) than the sand, which is approximately 0.5 millimetres. As water flows from the SCU onto these filters, some materials are trapped in the surface and some are trapped at depth. Filters No. 1 & 2 are equipped with individual gauges that measure the loss of head in the filters, meaning the resistance of the passage of water through the filters. There is a combined meter for filters No. 3 & 4. The maximum loss of head recorded by the meters is 2.9. On evidence, the practice was to backwash whenever the filters reached 2.4 or 2.5, irrespective of the number of hours of operation. Irrespective of the loss of head, the filters were also to be backwashed after approximately 70 hours of operation.

The plant has a filter console that records the total number of hours on the filters before a backwash occurs along with the time and date of each backwash. There is a filter log book which shows when the filters were turned on, when they were turned off, the loss of head, and the flow rate. Information from the log book was not always entered in the plant computer.

The backwash process in this plant includes an air wash. Air under pressure is injected through the under-drain system up through the filters to create a scrubbing motion between the media loosening trapped particles so they can more easily be removed in the hydraulic backwash. Following the air wash, water is forcibly reversed through the filters. This expands the separation in the media and allows the water to wash off the particles previously trapped.

During periods of peak demand, the operators might air wash the filters only to get them back on-line as quickly as possible. This was not equivalent to a backwash. It took approximately one hour and ten or fifteen minutes on filters No. 3 & 4 from the time they were drained down to the time they were put back on-line. The filters were not run to waste after being put back on-line.

The operators, apart from the loss of head, understood the filters had to be backwashed because organisms and organic material could build up in them, and they did not wish to get to the point where something started growing in the filters. They were aware that the presence of material in the filters required the injection of more chlorine to maintain the same chlorine residuals in the clearwells. After the filters were backwashed the chlorine residuals would rise to the point where chlorine dosages could be lowered.

From the filters, the treated water flows to two clearwells that serve as pumping reservoirs for water to the distribution system. One clearwell is in the old section of the plant under filters No. 1 & 2, and the other is under the new section where filters No. 3 & 4 are located.

There is a residual recorder that monitors chlorine levels in the clearwells as a combined sample. The pipe to which the recorder is attached draws water from both clearwells. Thus it is not possible to measure chlorine residuals in one clearwell only unless it is done manually.

There are turbidimeters that measure the turbidity of the water in the clearwells. One is located between the two clearwells and gives a combined turbidity reading. This turbidimeter has a maximum reading of 1 NTU and produces a continuous circular chart over a 24 hour period. This chart is used to indicate to the operator any changes in turbidity so that adjustments can be made accordingly if turbidity is on the rise. In the clearwells there is a separate turbidimeter for each that gives a three digit readout. These turbidimeters are the ones from which turbidity readings are recorded hourly and written into the plant's manual log.

If the operators wish to test the turbidity of the raw water or water in the SCU they can do so by taking a grab sample. This involves taking a sample, pouring it into a vial, putting it into a machine, activating the machine, and reading the number.

One of the major limitations of the plant prior to April of 2001, was its inability to run water to waste. There was a technical means of wasting water from the SCU through filters No. 3 & 4 but it was difficult to do and, in fact, was not done except after the annual cleaning of the SCU. Due to a design flaw, the elevation in the building was wrong and attempting this method of wasting water could result in flooding the lower sump in the building. Filters No. 1 & 2 did have the ability to waste water after backwashing and before the filters were put back on-line, but this was not done. The clearwells did not have a pumping system that would allow water to be wasted from the clearwells.

The absence of individual turbidimeters on the filters in the plant, and the absence of the ability or practice to run water to waste with the resulting absence of any ripening of the filters before water was placed back on-line, was not in accordance with industry standards in the year 2001. Consequently, the North Battleford surface water treatment plant was not a capable plant in March of 2001.

As will be discussed later herein, (see page 173), when a contamination event results from the production of drinking water there is seldom only one factor that has gone wrong. Usually it is a combination of factors which have challenged the plant, or its processes, that lead to the contamination event.

For reasons that will be reviewed later herein (see page146) for the period of March 20 to April 23, 2001, no settling was being achieved in the SCU in the surface water plant. One can only speculate whether *Cryptosporidium parvum* would have found its way into the treated water if the filtration equipment and practice outlined above had been in place, or whether the filtration process would have removed the *Cryptosporidium parvum* despite the lack of sedimentation in the SCU. This makes the fact North Battleford did not have a capable surface water treatment plant a circumstance relevant to the contamination event which occurred in March-April, 2001.

FINDINGS

10. Prior to April, 2001, the surface water treatment plant was not a "capable plant" by industry standards.

11. The fact that the surface water treatment plant was not a "capable plant" has a direct bearing on the *Cryptosporidium parvum* contamination of March - April, 2001.

(b) Operations

Upon commencing his shift, a plants operator first checks the tower chart to determine how much water needs to be pumped, and for what period of time pumping will be required. The main emphasis is to keep the water tower up and always have enough water in it. The level in the water tower will determine how quickly startup of the plant will take place.

In the busy season, the relieving operator arrives 10-15 minutes early and walks through the plant with the operator whose shift is finishing. He notes river levels, how dirty the river is, and any operating problems the previous operator has encountered. During the winter season the plant may not operate for a day or two and, even when it is operating, it may be for only one eight hour shift per day. In peak times the plant may be operated up to 24 hours per day.

When shutting down the plant, the clearwell is usually left half full so that water can be released from the clearwell to the distribution system when the plant is again started up. This covers the period until the plant is again pumping water into the clearwells. On shutdown, the SCU is always left full. Filters No. 3 & 4 are left with 14 feet of water and filters No.1 & 2 with three to four feet of water in them. One of the concerns of operators is that when the plant is shut down, chlorine levels in the clearwells dissipate overnight, and there is no way of post-chlorinating these clearwells. They had tried to post-chlorinate in the fall of 2000 by running a PVC pipe from the chlorinator and putting it in the clearwell. However, it produced too much chlorine gas in the building, thereby creating an unsafe environment. This practice was discontinued.

There are two main variables upon starting up the plant in the morning: raw water turbidity and temperature. After determining the dosage rates of chemicals to be added to the SCU, the pumps are started and raw water begins to enter the plant. Thereafter, the amount of chemicals injected is determined largely by how well the SCU is working and the settlement rate that is being achieved. There is a control valve that controls the amount of raw water entering the plant. If the volume of raw water increases, the valve automatically adjusts the chemicals being injected into the water to maintain the established dosage. Water passes through the plant in two hours during slower periods and as quickly as 35-40 minutes during peak demand.

At startup there is floc right at the top on the outside perimeter of the SCU. Polymer is added for 20 to 30 minutes for the purpose of pulling the floc down to the bottom of the SCU. Once there is clarity in the water in the outer perimeter of the SCU, the plant is started up. Achieving clarity in the SCU water before starting up the plant ensures that dirty water does not proceed through the launder tubes to the filters.

As noted earlier, to determine how well the SCU is operating, the operators rely on a settling test. The goal is to achieve 12-15% settling in the SCU. One operator indicated he preferred to see 15-20% settling. The manufacturer of the SCU advertised 5-10% settling. The amount of chemicals injected varies depending on the amount of settling being achieved. Operator experience is an important factor in determining the required level of chemicals at any particular time. As one operator stated, "You are running a lot of the time by the seat of your pants." There was no lower limit established on the amount of settling that must take place in the SCU.

With respect to the injection of chlorine, the chlorinator has a rotometer that goes from 0 to 100. The operator determines what chlorine residuals are desired and sets the rotometer at that point. Thereafter, the operator checks the chlorine levels in the launder tube before the water goes to the filters, and also checks the chlorine in the clearwells from time to time. Chlorine levels are checked for both free and total chlorine. These tests are done once an hour and the results entered on the manual log and, time permitting, entered into the plant's computer.

The amount of chlorine injected into the SCU is determined by the chlorine residuals being recorded in the clearwells. One of the problems for operators is that overnight chlorine residuals in the clearwells could drop from 0.5 down to as low as 0.1 milligrams per litre. It was assumed in such cases that the chlorine contact time had been long enough to kill any bacteria in the water. In periods of high demand, or if the operator wishes to start pumping water sooner rather than later, a barrel of granular sodium hypochlorite is kept at the filters. Some of this sodium hypochlorite placed in the launder tubes and onto the filters prior to startup raises the chlorine levels in the clearwell. There is no written policy as to when this should be done and it appears to be left to operator discretion.

Turbidity readings from the clearwells for the most part did not exceed 1 NTU. However they did on occasion exceed this limit.

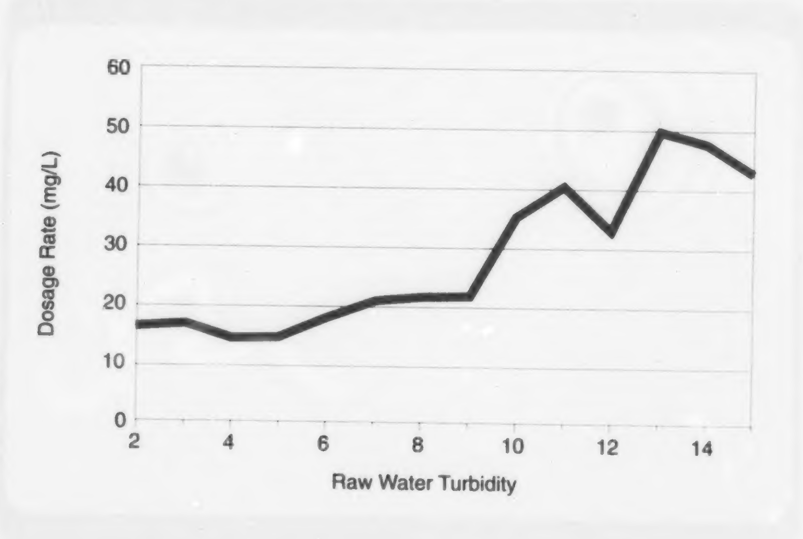
A review of the manual log maintained by the operators indicates that there were five days in the year 2000 where turbidity readings in excess of 1 NTU were recorded for at least part of the day. However, as noted earlier, the turbidity readings recorded were a combined reading for both filter banks. It cannot be known if at any time one filter bank was producing water in excess of 1 NTU while the other was producing water under 1 NTU for an average that was below 1 NTU.

The SCU was totally cleaned at least once a year. This would be accomplished in one day and would normally be done at a time of low demand during the winter months. After the cleaning, water was run to waste through filters No. 3 & 4 for a period of time before pumping to the clearwells. One operator testified his experience was that the water would be run to waste for somewhere between five hours and a day and a half. It will be noted later herein that when the SCU was cleaned on March 20, 2001, the water was pumped to waste for only 3.5 hours. All of the operators recognized that it was desirable to have a decent floc blanket forming, which meant adequate settling before pumping water through the plant. However, it was acknowledged that this was sometimes difficult because in the winter months turbidities are extremely low (down to 0.3 NTU in raw water) and it could take days or up to two weeks to achieve proper settling. In most cases the demand for water would require the operators to pump even if an appropriate settlement rate had not been achieved.

The operators' training was directed solely at obtaining the lowest possible turbidity in the water entering the clearwells and ensuring that the appropriate chlorine residuals were achieved. The most senior operator who testified believed that chlorine would kill anything that might be in the water, and the point of obtaining as low a turbidity as possible was to ensure that the chlorine would be more effective and not be masked by any particulate matter that might remain in the water. This person testified that he did not understand there were water safety issues associated with the turbidity measurements, beyond making the chlorine effective.

There were no manuals or protocols for the operation of the plant, nor were there any precedent materials which could inform operators how a turbidity problem or a settlement problem had been handled in the past. The Prince Albert water treatment plant produces charts for operator reference indicating optimum dosage rates for chemicals at various turbidities, an example of which follows:

Fig. 9
CITY OF PRINCE ALBERT
ALUM DOSAGE RATE



Source: City of Prince Albert
Exhibit C-118 Tab 7

There was nothing in the evidence to suggest the operators did not use their best efforts to achieving the lowest turbidity possible in the finished water. However, each operator was left to his own skill, experience, and judgment on how best to accomplish this.

FINDINGS

12. Prior to April, 2001, there was an absence of quality control parameters and quality assurance policies for the operation of the surface water treatment plant and each operator was left to operate without guidelines.

RECOMMENDATIONS

3. Each permit to operate a surface water treatment plant should require as a condition to operate that there exist a quality control/quality assurance written policy in place that is acceptable to the regulator.

c) Record Keeping

Two principal records were maintained at the surface water treatment plant:

(i) a manual written log completed by the operator on each shift. The operators were expected, each hour, to record the raw water turbidity, the pH, the temperature, launder turbidity, launder free chlorine reading, percentage settling, and free and total chlorine residuals in the treated water; and

(ii) a computer record of much of the same material that is entered by operators from the handwritten log when they have time to do so.

It was acknowledged at the hearing that the computer record keeping was deficient in a number of respects. The program had been installed by a former operator. One of the problems was the default mechanism in the program. If information was not entered with respect to any one of a number of matters recorded in the manual log, the computer defaulted to the previous reading that had been entered. This minimized the value of the computer record because in each instance it was necessary to compare the same with the manual log to determine if the recording was an accurate one or simply a default recording. The second problem was that the computer recorded the time of the entry rather than the time that the particular reading or test was taken. In other words, a reading from 11:00 a.m. that was not entered into the computer until 12:00 p.m. would show the reading as 12:00 p.m., at which time the manual log may well reflect a different reading. The third problem with the computer identified by the operators was that sometimes when they attempted to insert information the computer would “skip out on us.” “Skipping out” was not clearly defined, but the result was that the information was not recorded. The operators also acknowledged that no doubt occasional mistakes were made in transposing the handwritten record to the computer.

The computer’s only other function was to allow the operator to calculate chemical dosages in relation to the number of seconds the pump for each chemical is running. The operator can then go to the control panel for the chemicals and decide how many seconds in a minute the pump should run for each chemical. The number of seconds each pump runs is entered in the computer, not on the handwritten log sheets. If the operator changes the timer for any one of the chemicals the new number of seconds has to be entered into the computer. The computer is not hooked into any of the chemical feeders or any of the pumps, so if the operator does not enter a change in the computer it will default to the previous entry and record the previously entered dosage. One of the operators admitted that "we have all at one time or another neglected to put the dosages in the computer."

The operators were reasonably diligent in attempting to maintain an accurate manual record of what had transpired on their shift. They were uniform in emphasizing that the handwritten log was really the only accurate record that could be relied upon (though even this was not perfect) and that the computer program was deficient. The computer record was not accurate enough to be reliable for the purposes of third party inspection. There were no monthly, quarterly, or annual reports prepared with respect to the records maintained. There was no routine review by the foreman of the records that were generated. Mr. Katzell indicated he relied on the operators to verbally inform him of any problems which were encountered on any one shift.

The computer makes provision for operators to enter comments with respect to any matter worth noting that occurs on their shift. The computer record indicates that the comments entered by operators with respect to problems they encountered, or solutions they discovered, diminished from 1998 onwards. Operators came to rely on an oral briefing from the previous operator as to conditions at the plant when commencing a shift.

In North Battleford there was no maintenance record to show when work had been performed on the plant or equipment that could be reviewed by a third party. There was no written timetable for when routine maintenance was to be performed in the plant. The evidence indicates maintenance was performed on an ad hoc basis at the direction of the foreman.

FINDINGS

13. The record keeping system at the surface water treatment plant was primitive, and in many cases, incomplete. The computer record was often too inconsistent with the manual record to be relied upon.

14. The record keeping system did not easily lend itself to third party review.

15. There was no policy in place for internal or external review of the record keeping at the surface water treatment plant.

RECOMMENDATIONS

4. **That each permit to operate a surface water treatment plant specify as a condition for operation the record system that shall be maintained within the plant, and also specify a monthly internal review process to ensure that operating parameters within the permit are consistently being met.**

(d) Operator Training and Education

The inquiry heard from three operators, Mr. Patrick Fluney, Mr. Frank Hollman, and Mr. Peter Allen, with ten, six, and three and one-half years experience, respectively. At the time of the outbreak in March, 2001, there were eight operators. The two most junior operators had been hired in the year 2000 and were classified as assistant operators in April, 2001.

Operators hired prior to 1995, which included three of the eight, were required to have a Grade X or a Grade XII education, depending on the date of hiring. In 1995, a two-year engineering technologist diploma or equivalent was required of new employees in the plants department. It was known at this time that the province might be moving to a mandatory certification program, which, in part, provided the impetus for this change. However, Mr. Katzell testified he recognized that technology would increasingly have a role to play in the future and a better-educated candidate would not only have the education to understand new technology, but also might embrace it.

Once hired, each operator was required to complete a correspondence course on surface water treatment offered by the Western Canadian Water and Waste Water Association, or an equivalent course offered by a number of other institutions. Prior to 1995 the Western Canadian Water and Waste Water Association course was the only one available to the operators in the North Battleford plants department. The course consisted of 15 lessons that dealt with different aspects of a surface water treatment plant and its processes. The course was designed to provide not only generic information, but to require the student to answer questions with respect to the specific plant in which he was working. The operators described the course as basic. A newly-hired operator was given three years to complete the course. The evidence establishes that four operators had completed this course. One senior operator had not, nor had the two new assistant operators.

The newly-hired operator would spend time with an experienced operator until the foreman of the plants department was satisfied he could operate the plant. Estimates suggest a person would be in training two to three months, the length of time varying in accordance with how quickly the new employee learned. The foreman would acquire knowledge of the new operator's capabilities by accompanying the new operator around the plant and asking questions on how things operated, how to identify problems before they develop, questions on pumps and chemicals, etc. The operators felt they were qualified to operate the mechanical processes of the plant by the time they were left on their own. Telephone advice was available from the foreman and other operators if required. There was no formal evaluation process in place with respect to new employees.

During the period from December, 2000, when Mr. Katzell retired, to August, 2001, when a new foreman was hired, the operators were left to their own devices in operating the plants. In the interval a foreman from another department was assigned to do the paperwork associated with the plants department, but this person had no knowledge or experience in water treatment. During this time there was no one person in charge of the training of the two new assistant operators, and yet these persons were permitted to act as operator-in-charge at the various plants. There is no suggestion this fact had anything to do with the *Cryptosporidium parvum* outbreak, but it was recognized by the existing operators that this was a problem. In a letter to city council and city management from the plants department dated January 12, 2001, in which the operators outlined a number of concerns, the following were identified:

> No qualified and certified supervisor on staff.
>
> Assistant operators and plant operators duties and responsibilities.

The operators' concern about the absence of a qualified supervisor was repeated at an occupational health and safety meeting on March 14, 2001, which Mr. Strelioff attended. The minutes state: "lack of competent supervisor/foreman remains an issue."

The operators who testified were not particularly knowledgeable on the requirements of the permit to operate the various plants, nor were they familiar with the recommendations in the Canadian Drinking Water Guidelines.

With respect to the Guidelines, Mr. Katzell testified:

> Q They didn't particularly have a knowledge of the Guidelines per se, that was something that they would get from you; is that – is that correct, first of all?

A That's correct – that's correct, yes.

Q Okay.

A I – I looked after the – the Guidelines, but also what I placed at the plants was a small booklet that SERM had put out that would state the chlorine residuals and turbidities and a few other things for water treatment plants and – yeah, for water treatment plants; those were – those little booklets were – were at the plants.

Q And did you ensure that the operators read them and took notice of them?

A Well, I put them on the desk down at the plants so he would have had to have seen them, why – whether he chose to read them or not within his duties, I can't say

With respect to developments or new information in the water treatment industry, Mr. Katzell indicated as follows:

Q In relation to – just another area on education. In relation to continuing education, ensuring that your operators stayed up-to-date with new trends and new knowledge in the industry, how did you go about ensuring that occurred?

A Well there is – one of the things was there was – there was newsletters – industry newsletters that would – that were sent to us and they were kept in a file box at the sewage treatment plant, available for the fellows to read. There would be courses that – that I would get sent to, the conventions that I would go to, I would relay information back to them sometimes, not all the time, but, you know, depending on what applied to our place, yeah, I would talk to them, yeah.

Q I think you told us earlier –

A But – I wouldn't take all eight of them and sit them down in – in a room and say, you know –

Q	Right.
A	– No, I wouldn't do that, I couldn't do that –
Q	Right.
A	The operation wouldn't allow that.

Until the fall of 1997, SERM published a quarterly newsletter called *The Clear Water Reporter* which, among other things, contained articles on water and wastewater treatment, and also informed readers on upcoming conferences. Employees of SERM testified that the purpose of the foregoing publication was to keep managers and operators of water treatment plants informed about best practices in the industry. Following 1997, SERM abandoned this publication and co-operated with the Saskatchewan Water and Wastewater Association (SWWA) in the preparation of its bi-monthly newsletter entitled *The Pipeline*.

SERM witnesses indicated that it was the practice to forward to each employee of water treatment plants anywhere in the province who were on record with the Operator Certification Board a copy of *The Pipeline*. This statement was not accepted by all of the operators. As noted above, Mr. Katzell said he would leave his copy of any industry publications he received at the sewage treatment plant. One operator indicated that he attempted to read such articles in depth. The other two operators testified the most they ever did with respect to any such publications was to "skim" them.

It is worth noting at this point that operator shifts at the surface water treatment plant amounted to something less than one-third of an operator's work load in the course of a year. The same people operated the sewage treatment plant and the ground water treatment plant, and were also assigned to a well maintenance shift from time to time. This is mentioned to point out that in terms of continuing education courses their duties left a lot of ground to be covered. In addition, occupational health and safety courses for operators were mandatory in a number of areas. In fact all employees took far more occupational health and safety type courses than water treatment or wastewater treatment courses. An example of the courses that most of the plant employees had taken at various times up to the year 2000 included: Occupational Health and Safety Level I, Occupational Health and Safety Level II, first aid, CPR, chlorine workshop, fire extinguisher training, confined space entry training, and transportation of dangerous goods training. Three of the employees had completed the basic wastewater treatment and the intermediate wastewater treatment courses. None of the employees had attended or taken additional water treatment courses beyond this basic correspondence course. There was no organized in-house training on the topics of water treatment and wastewater treatment.

The water treatment and wastewater treatment industry puts on annual conferences that, like most industry courses, provide participants with information on new developments in the industry, new equipment and technology in the industry, etc. Two such conferences, arranged annually for membership, are the Saskatchewan Water and Wastewater Association conference and the Western Canada Water and Waste Water conference. Mr. Katzell, as foreman, attended a number of these conferences until 1997 but did not attend thereafter. Mr. Berry, director of public works and engineering in North Battleford from 1994-99, also attended several of these conferences. Only one operator in recent years attended either of these conferences and it was the SWWA conference in 1998.

The theme that emerged from the operators' testimony was that it was difficult for operators to receive additional training and continuing education with respect to sewage treatment and water treatment because of a shortage of manpower in the plants department. One employee testified that, when he asked to attend a conference in the year 2000, he was told to work out the time that would be required with the other operators. The implication was that if he could persuade another operator to cover his shifts he could go. Likewise, there was a perception among the operators that the city was reluctant to incur the expense for employees to obtain out-of-city training. The staff training expenditures for the ground water plant, the surface water plant, and the sewage treatment plant for the year 2000 were, respectively, $785, $785, and $752.63. In each case $1,000 had been budgeted. In the letter to city council and management from the plants department of January 12, 2001, (see above), another concern identified was "continuing education and upgrading courses."

Operators were asked if they often had occasion to speak to plant operators from other communities. No operator had a relationship with an operator in another community from whom he could seek advice. The operators also indicated that at no time during the 1990s did they receive a visit from a SERM official for the purpose of ascertaining if there were any problems, or to review the plant and its operations. One operator expressed the view that the management style of Mr. Katzell did not encourage operators to seek advice from anyone other than him.

Specifically with respect to *Cryptosporidium parvum*, the senior operator who testified stated he did not know anything about the parasite beyond having heard the word mentioned from time to time. The operators with six years and three and one-half years each claimed to have some knowledge of the parasite and were aware that it could cause enteric disease in humans. Both of these operators stated they were aware that chlorine would not kill *Cryptosporidium parvum*. On April 7 and 8, 1998, these same two operators had attended a wastewater meeting in Vanscoy, Saskatchewan, where they spoke informally with a councillor from Vanscoy. He informed them that there had been a *Cryptosporidium parvum* outbreak in that community, which operates a ground water plant, and for the first time they learned that chlorine would not kill *Cryptosporidium parvum*.

Mr. Katzell indicated he first became aware of *Giardia lamblia* and *Cryptosporidium parvum* after an outbreak of what was described as "beaver fever" in Banff, Alberta. He could not be specific about the date, but he recalled a conversation with Mr. Donald Hilsendager, the SERM representative in the area at the time, who had recently attended a conference in which the Banff outbreak had been discussed. Mr. Katzell indicated Mr. Hilsendager had emphasized the coagulation, flocculation, sedimentation process as a barrier to *Cryptosporidium parvum*, but he had also left Mr. Katzell with the impression that *Cryptosporidium parvum* and *Giardia lamblia* were a bigger problem in quiet surface waters than they were in flowing waters such as the North Saskatchewan River. It is clear Mr. Katzell was aware of the parasite *Cryptosporidium parvum*, but this does not mean he understood the importance of a multi-barrier approach to eliminating the parasite from treated water, as his actions during removal of the vari-drive in the SCU (discussed later) make clear. Mr. Katzell agreed he never did address his operators on the issue of *Cryptosporidium parvum*.

The Battlefords area had a mini outbreak of *Cryptosporidium parvum* in the months of August and September, 1994, when 21 cases were reported, six in August and 15 in September. Seven other cases were reported throughout the balance of the year. In 1995 there were nine, five in 1996, one in 1997, five in 1998, zero in 1999, and zero in 2000. On September 26, 1994, Carla Wilson, a public health inspector with Saskatchewan Health, wrote to

F2

Mr Berry, the director of public works and engineering, and advised him that water samples had been taken from the surface water treatment plant, both from the raw water and treated water, at the request of the provincial laboratory for the purpose of testing for *Cryptosporidium parvum*. The letter indicated that testing was required because of "reported cases of *Cryptosporidium parvum* in the North Battleford health region." On October 19, 1994, the provincial laboratory reported the results of the testing and these were passed along to Mr. Berry on October 21, 1994. The report indicated that testing was negative and went on to say "this negative may not be a true reflection of the water quality due to the small sample size tested and the sensitivity of the technique used is not known. We will have to call it negative for the technique used and the sample size." Mr. Berry could not recall if he had discussed this matter with Mr. Katzell at the time.

On October 18, 1994, Mr. Berry received an advertisement from the American Waterworks Association (AWWA) advertising a video on *Cryptosporidium parvum*. The flyer stated in part:

> Recent water-borne disease outbreaks and heightened media attention make the need for up-to-the minute, credible information about Cryptosporidium more important than ever.
>
> That's why AWWA has created an all-new video called "Understanding the Cryptosporidium Challenge: Preventing Water-borne Disease." The 15-minute professional production is designed to help water suppliers develop prevention and treatment strategies to fight this dangerous pathogen.

Mr. Berry could not recall what he did with this advertisement. The evidence was that the video was not purchased and was never available to operators in North Battleford. On the other hand, the Prince Albert treatment plant did purchase the video and has had its operators review the same on a number of occasions.

The evidence establishes that Mr. Katzell's management style was authoritarian. He decided how the plant would be run at all times. There was no climate or culture of learning that was encouraged within the plants department, and as a result there was little incentive for operators to educate themselves.

The event that indicates perhaps more than any other that Mr. Katzell did not totally appreciate the multi-barrier approach as a defence to *Cryptosporidium parvum* was his decision on February 10, 1999, to remove the vari-drive in the SCU for repair. He anticipated initially that repairs would take only one week. Mr. Katzell stated he had advised the director of public works and engineering at the time, Mr. Berry, that this repair, which was estimated to cost $5,000, should be done during the week of January 2, 1999. He stated:

> I was trying to be very careful of when I chose to do this, because I recognized the implications of – of not having this unit working. Because of the amount involved Mr. Berry had to obtain budget approval which took approximately another month.

Mr. Katzell stated he had been assured by the party to whom the equipment was being shipped for repair that it would be returned within one week. As it turned out, the person who was to do the repair became ill and the repair work had to be shipped elsewhere with the result the equipment was not returned until the first part of April, 1999. Mr. Katzell indicated he had discussed this with Mr. Berry. He testified:

> [T]he other thing that enters into this, and – and I discussed this with Mr. Berry, he asked me he said well what about No. 2 water plant are we going to have to shut that down, he said No. 1 water plant isn't producing enough water, you know, that's what you've been telling me, you know to – to keep the city – the city going so we have to run No. 2 water plant.
>
> I said I – I recognize that so I said what I plan to do is make sure our reservoirs are full, our tower is as full as possible and that we – if we have to – if we have to run No. 2 water plant, that it would be run only enough to keep the tower up, not necessarily full, full is 25 feet.

Mr. Katzell went on to say:

> Yes well, the – the degree that I thought we could do this, the – the thing is that made me think that it would be Okay to do this was that our chlorine system was working well, the raw

> water conditions were about the cleanest that you could ever get, the – the turbidities that – that were leaving the place were going to be – definitely waters were going to be within an acceptable range, the rest of the equipment was working fine so it was my – my judgment, my estimate and my experience that said, Okay, I'm prepared to go with this because if we – if we didn't get that unit repaired we were going to be – have a lot of difficulties.

The foregoing event is included in this section on operator training simply to point out that neither Mr. Katzell nor Mr. Berry appreciated the potential risks of operating the plant without any proper settling occurring in the SCU. Mixing occurs between water from the ground water plant and the surface water plant in the water distribution system, and continuing to operate the surface water plant during this period of time jeopardized the water supply for the whole city.

The vari-drive was not returned until the first part of April, 1999. The surface water treatment plant continued to operate in the interval, and the records indicate that zero settling was achieved during this time. Two of the operators had questioned Mr. Katzell about operating the surface water treatment plant without the vari-drive in operation to assist the coagulation, flocculation, sedimentation process. They did not specifically raise *Cryptosporidium parvum*. Mr. Katzell told them the plant could be operated safely based on the raw water turbidities prevailing at that time and the turbidity and chlorine levels of the finished water. Indeed, the plant did easily meet final turbidity guidelines for the days it operated without the vari-drive. As it turned out, no known health problems resulted.

In the May, 1999, edition of *The Pipeline*, the lead article was entitled "Giardia and Cryptosporidium in Surface Waters." The article emphasized the need to "ensure treatment processes, especially coagulation, flocculation, filtration and disinfection, are in continuous use, and are always working at peak efficiency." One of the operators testified that he specifically brought this article to the attention of Mr. Katzell to more or less reinforce his earlier statement that there should be concern about operating the SCU without the vari-drive in operation.

When settling problems in the SCU occurred commencing March 20, 2001, the operators were without supervision, Mr. Katzell having retired in

December, 2000. In the days that followed, no one identified the possibility of *Giardia lamblia* and/or *Cryptosporidium parvum* contaminating the treated water with the lack of settling. As Mr. Fluney testified, no one brought to his attention that *Cryptosporidium parvum* could still be a problem if the plant was meeting guideline turbidity and chlorine residual levels. He summed up his evidence on the issue of *Cryptosporidium parvum* by stating he had experience, but no knowledge. He stated it would have helped if the person supervising the operators had more knowledge than Mr. Fluney did.

FINDINGS

16. Neither management, nor the operators of the surface water treatment plant, fully comprehended the multi-barrier approach required to effectively remove *Cryptosporidium parvum* from raw surface water.

17. Neither management, nor the operators of the surface water treatment plant, knew that *Cryptosporidium parvum* could be present in raw water that measured 3 NTU or less, and could be present in finished water that measured 1 NTU or less.

5. Supervision and Management

Mr. Ivan Katzell started work in the North Battleford Plants Department on February 5, 1973. He became plants foreman in 1981, a position he held until he took early retirement effective December 31, 2000. Until 1986 the city administration included a director of public works who supervised all public works except for the plants department. In that year the plants superintendent became the director of public utilities with a combined responsibility for all public works, including the plants. At this time the plants superintendent moved his office from the sewage treatment plant to city hall. From at least 1975 through to 1986, there had existed two out-of-scope persons in the plants department, including a superintendent and an assistant to the superintendent, as well as seven operators. From 1986 onward, Mr. Katzell became the sole out-of-scope person in the department and was responsible for all aspects of administration of the plants.

On July 6, 1988, Mr. Katzell wrote a memorandum to the director of public utilities, who still held the subtitle of superintendent of plants, and requested an additional operator for the plants department and an additional out-of-scope person for the plants department. An extra operator was requested because of work overload, expanded operator duties, and the anticipation of additional work in the future. The additional out-of-scope person was requested to provide closer supervision of staff, better control over plant operations, and future needs. The memorandum specifically identified that the surface water treatment plant "needs management present more often and longer to ensure critical tests and procedures are being followed." The memorandum concluded:

> If the present work load continues unaided by additional staff and future department responsibilities are added, I feel that my capabilities to handle the work load will be stretched beyond what is acceptable. This can only lead to poor department operation and poor staff morale.

No increase to the staff in the plants department occurred prior to the *Cryptosporidium parvum* outbreak in March and April, 2001, and there were periods of time when the plants department was down to six and one-half operators.

On January 10, 1989, Mr. Katzell wrote a further memo to the city engineering department, with a copy to the director of public utilities and the city engineer. The covering letter to the memorandum stated as follows:

> I feel that the department needs at least one more out-of-scope personnel right now to alleviate some of the work load and deal with some of the problems I will outline on the enclosed pages.
>
> Since 1986 when Ray Thompson was removed from the sewage plant location, the department has in effect been short one person. This extra work load over the long term has caused me much frustration in not being able to get work done in a more reasonable time and manner.
>
> I realize the time and finances involved to help correct these problems will be extensive, but I raise them out of a genuine concern for the future development of this department.

Mr. Ray Thompson, who had been the plants superintendent, retired in 1992. He was replaced by the city engineer employed at the time. Thus, where previously there had been both a director of public works and utilities and a city engineer, these positions were reduced to one. Mr. Robert Berry, a professional engineer, took the job as director of public utilities in 1993, and remained in that position until retirement on June 30, 1999. At the time Mr. Berry became director of public utilities Mr. Katzell presented him with a memorandum on the sewage treatment plant. In this memorandum Mr. Katzell stated in part that "with our present flow design we are not meeting our required standards as set out by the provincial government agency, Sask. Environment" and "by the tests of river water samples sent in for analysis, our sewage treatment process is adversely affecting our finished water quality coming out of No. 2 water treatment plant."

Following Mr. Berry's resignation, Mr. Randy Strelioff became the new director of public works effective November 15, 1999. Mr. Katzell used this occasion to update Mr. Strelioff on the condition of the plants. He wrote a memo with respect to each water plant and the sewage treatment plant. The ground water plant memorandum indicated that "the treatment process that we are using to clean our water is wholly inadequate, outdated, and will not be able to be improved upon." With respect to the surface water plant he observed that "this plant also suffers from old age, old technology and poor design." As noted above, an engineering study had been received by the city with respect to the sewage treatment plant in January, 1997. In his memo to Mr. Strelioff, Mr. Katzell made the following point:

> Without exception this plant operates as good as it does because of the operating staff. This plant is obsolete, potentially hazardous and will cost millions of dollars just to make it operate to meet the guidelines which under normal circumstances, by today's standards of plant design, it should have been able to do. ... Under the operating budgets this plant is only receiving patchwork repairs that do not help to improve the quality of its effluent but simply maintain the best we can do with what we have.

Mr. Katzell took stress leave for two months in the fall of 1999. In March, 2000, he advised Mr. Strelioff, now the new director of public works, that the odds were better than fifty percent that he would retire at the end of the year. Mr. Katzell submitted his resignation to the city dated July 31, 2000. The letter stated in part as follows:

> I am retiring earlier than I had planned because of stress due to work overload. I can no longer endure under the present, or foreseeable future, management arrangement in my department of only one out-of-scope person.
>
> After 15 years of added responsibilities and many requests for help, that went unheeded, the work environment has slowly but continually affected both my mental and physical health and I am no longer able to work effectively under these circumstances.
>
> I remain loyal to the City and will do all I can to make this transition go smoothly.

Mr. Berry did not have any experience in water treatment or wastewater when he became director of public utilities in 1993. He stated that throughout his term he relied completely on Mr. Katzell to operate the plants department. He had no contact with the plants operators, and was only called down to the plants by Mr. Katzell if there was an issue related to large expenditures of money. In this context, large appears to have meant anything over two thousand dollars. Mr. Berry agreed in his evidence that Mr. Katzell raised the staffing issue with him shortly after he arrived and annually thereafter. Mr. Berry indicated he was supportive of Mr. Katzell's requests in this respect but he could not obtain funding for an additional person. Budget requests would go to Mr. Douglas McEwen who was the then city commissioner. Mr. Berry indicated that any such request would invariably be met with a question as to whether the plants operations could get by for the coming year with its existing compliment of personnel. Mr. Berry would answer "yes" and that was the end of the matter. Mr. Berry indicated fiscal restraint was always the reason offered for not increasing the staffing.

In 1996, Mr. McEwen requested a report from Pommen and Associates Limited, to determine if the public works and utilities department could operate in a more efficient manner. The plants department was not the main focus within the public works and utilities department, but Mr. Berry and Mr. Katzell were two of the 15 persons interviewed for the report, which did make a number of comments on the plants department.

In Article 3.5, the report stated in part as follows:

> Limited automated alarms and controls regulate the mechanical, chemical and biological processes within the two water production plants and the sewage treatment plant. Without the benefit of automated process controls to maintain quality of potable water or discharge effluent, the Plants' Foreman and the staff must know the expected outcomes of the treatment processes at critical stages to be able to adjust and modify mechanical functioning, chemical dosages and biological processes.
>
> The plants have not been upgraded in recent years. The technology in the plants is typically older technology. Technical evaluation of the sewage treatment plant by engineering consultants has identified improvements necessary to allow the plant to meet effluent discharge standards on a consistent basis. Ingenuity and skill of the Plants' staff are required to keep these three facilities functioning and compliant with provincial standards.

In Article 2 of the recommendations entitled "Plants Operation," three recommendations were made.

Article 2.1 recommended:

> That technical training in water treatment and wastewater treatment processes be required for all future hiring as plant operators.

In outlining the purpose for the recommendation, the report stated in part:

> Limited technology and monitoring devices and alarms exist within the plants. Process quality control rests primarily with the plant operators. As the plants age, the likelihood of equipment downtime increases thus adding onus on plant operators to make informed decisions based upon technical knowledge.

Article 2.2 recommended:

> That instrumentation and alarms to monitor the process, volumes and current conditions within the plants and remote sites be given priority over plant modifications.

In explaining the purpose for this recommendation, the report noted with respect to the chemicals used in the water and sewage that "these chemicals, if used in an industrial setting could not be employed without monitoring devices and alarms."

Article 2.3 recommended:

> That "technical understanding of the plants limitations be aquired by PWUD (Public Works Untilities Director) for presentations to senior administration and elected officials."

Mr Katzell never did see this report. The report was available to Mr. McEwan, who requisitioned the same, and to Mr. Berry.

Mr. Berry indicated that throughout his tenure as director of public works there were no major capital expenditures with respect to any of the plants. He indicated that for the most part any expenditures on the plants came out of the operational budget in each year and were generally in the $5,000-$10,000 range. He confirmed he was aware the control systems in the water treatment plants required upgrading and automation, but the decision was consciously made not to upgrade the control systems in the surface water plant until such time as a new control system could be introduced into a new or retrofitted sewage treatment plant. His reasoning was that technology changes quickly and he wanted to ensure that whatever automated control system was introduced into the surface water treatment plant would be compatible with the control systems that were eventually introduced into the sewage treatment plant. He indicated that, following the receipt of the Reid Crowther report in January, 1997, he estimated it would be 5-10 years before a new or retrofitted sewage treatment plant would be operational.

On May 6-7, 1998, Mr. Katzell received approval to have Anthratech Western Inc. conduct an optimization study of the surface water treatment plant. The scope of the study focussed on evaluation of hydraulic issues and chemical optimization issues. Among the conclusions and recommendations were the following:

> There is no rapid or static mixing equipment at the point of injection of either liquid aluminum sulfate or aluminex. Although the existing piping configuration may allow some mixing of the chemical with the influent water to take place, an in-line static mixer would promote more uniform distribution of the chemicals throughout the raw water prior to entering the solids contact unit.
>
> ...
>
> Filter effluent quality from filters 3 & 4 is dramatically better than filters 1 & 2. ... Results obtained indicate that filters 1 & 2 are receiving approximately 30% higher flow rates per square foot of media surface area than filters 3 & 4. ... Further, influent flow rate measurement, with accurate flow measurement equipment, is recommended.

No action was taken on these recommendations.

Reference has been made to the Reid Crowther report and, in particular, the audit conclusions contained therein. Following receipt of this report in

1997, no action was taken by the city prior to the outbreak of 2001. Mr. Berry indicated the first decision required following receipt of the Reid Crowther report was to decide the capacity of any new or retrofitted sewage treatment plant. The existing plant was capable of being retrofitted for approximately the population which existed at the time of 14,000-15,000 persons. He indicated city council decided the city would grow and the new plant should have the capacity to handle 25,000 persons. In each year from 1997 to the year 2001, the capital budget reflected a $65,000 item for site selection for a new sewage treatment plant. The money was not spent.

Mr. Berry agreed that he and Mr. Katzell would have preferred to implement all improvements and modifications required for the plants sooner rather than later. He made the point that throughout his tenure the policy of the city, as conveyed to him by Mr. McEwen, the city commissioner, and various members of city council, was to hold the line on taxes and not to spend any money unless it was absolutely necessary. He stated he and Mr. Katzell tried to do certain minor things within the budgets that were approved, and it fell to Mr. Katzell to hold things together in the face of such a parsimonious attitude at city hall. Mr. Berry testified that on the few occasions council went to the rate payers to obtain approval for certain local improvements (unrelated to the plants) these initiatives were voted down.

Mr. Douglas McEwen was city commissioner for the city from May, 1986 to December, 1999. Mr. McEwen has a bachelor of arts degree which he obtained in 1961, and a certificate of municipal administration from the University of Manitoba. He spent 20 years managing YMCAs prior to getting involved in municipal administration. His role as city commissioner was to oversee day-to-day operations of the city through the various department heads, to report to council, to advise council on policy matters, and to implement policies established by council. Mr. McEwen was also the city clerk and attended all council meetings. He was the key leader of the budget process each year.

Mr. McEwen testified the City of North Battleford's revenue from the Province was reduced by $1,000,000 in the period between 1991 and 1995. He made it clear that he was proud of the fact the city had absorbed this reduction without any increase in the mill rate. He stated all department heads had been conditioned to appreciate that the city could not afford large increases and, as a result, all that occurred were minor adjustments throughout the 1990s. He was constantly striving for efficiencies within the various civic departments. He also stated that throughout the 1990s the City of North Battleford was one of the wealthiest cities in the province in terms of financial reserves on a per capita basis.

Mr. McEwen indicated he did not interact with Mr. Katzell on any regular basis. When he did it was usually at labour negotiation time. He did not know anything about water or wastewater treatment and did not hear directly from Mr. Katzell with respect to any operational concerns. He admitted that his knowledge, if any, on what was happening in the plants came through the director of public works. He felt that Mr. Katzell had the confidence of the several directors of public works during his tenure.

Mr. McEwen denied that any health concerns arising out of the condition or equipment in any of the plants were ever brought to his attention. This is consistent with Mr. Berry's lack of appreciation for any health risks arising from the condition of the plants or their equipment and staffing. Despite concerns expressed by Mr. Katzell, Mr. Berry appears to have placed his confidence in the fact that, in the end, Mr. Katzell would produce clean, safe water, regardless.

When speaking of the 1996 Pommen report, Mr. McEwen indicated his main concern was to reorganize the public works department to make it as efficient as possible, and also to obtain guidance on how city council could be kept better informed on the activities taking place within that department. He did not concern himself with the recommendations with respect to the plants. Concerning the 1998 Anthratech optimization study, Mr. McEwen stated he was not made aware of the report. Neither could he recall why the $65,000 budgeted for a new site selection for the sewage plant was not expended during his tenure. He admitted candidly that staffing of the plants department was frozen throughout the 1990s at the direction of city council who felt its mandate was to effect economies wherever possible. Mr. McEwen denied that he knew Mr. Katzell was stressed about the situation that prevailed in the plants department.

Mr. Randy Strelioff was hired effective November 15, 1999, to be the new director of public works. He replaced Mr. Berry who had resigned effective June 30, 1999. Mr. Strelioff's formal qualifications included Grade XII, and the completion of a four-month energy auditing course at Kelsey Institute. He had been employed by the City of Regina since 1989, first as an energy auditor, then as energy management coordinator, and finally as manager of energy and materials management. Mr. Strelioff's evidence was that he understood from the interviews he had in connection with his application that the city was looking for a person with management skills and that technical knowledge was not a requirement for the job. Mr. Strelioff made the point that the job in North Battleford involves an array of departments including plants, water distribution, roads, engineering, and airport and that it would be difficult to find one person who had technical knowledge in all areas. Mr. McEwen, who was involved in the hiring process, stated that there were engineering applicants for the position, but that, before interviews were conducted, he had recommended to council that they hire a manager rather than an engineer. Mr. McEwen stated the city had always relied on outside consultants for technical advice, and his recommendation was based on his expectation that this practice would continue.

Mr. Strelioff admitted he did not have any detailed knowledge of water or wastewater treatment when he commenced the job. He stated that until Mr. Katzell retired in December, 2000, he relied completely on him for expertise in operating the plants. He explained that "any time there was a question or an issue he seemed to have a good answer for it, and it seemed to make sense – based on what little technical experience I had."

Once he began his work with the city, Mr. Strelioff quickly came to the conclusion the sewage treatment plant was "pretty much a write-off" and this became a high priority for him. He indicated his second highest priority, from information he gathered in the first few months of the job, was the declining well capacity and production from the ground water plant. Mr. Strelioff agreed that the plants staff made a convincing argument to him that, because of the age of the plants and their technology, the city should be spending more money on the plants. He stated, however, that he was of the view the technology in the plants, although old, was still functional and could produce safe water.

Throughout 1999 and into 2000, many workplace occupational health and safety issues were raised by operators. Mr. Peter Allen, an operator since 1997, was particularly vociferous about occupational health and safety issues and repeatedly confronted Mr. Strelioff with his concerns. Mr. Allen was one of the operators who had been party to discussions with a Vanscoy operator about *Cryptosporidium parvum* in Vanscoy's ground water. Mr. Allen had his father, a microbiologist, do some research for him on whether the *Cryptosporidium parvum* parasite could possibly be a risk in connection with a ground water plant such as the one in North Battleford. His father reported back to him it was not likely *Cryptosporidium parvum* would be a problem in a ground water plant unless the water became contaminated from exterior sources. Mr. Allen was aware there was a horse pasture close to one of the ground water wells and this gave him grounds to raise the issue with management.

Unfortunately, Mr. Allen chose to use his limited knowledge on *Cryptosporidium parvum* as a bargaining chip in his pursuit of better occupational health and safety improvements in the plants. As a result, he was not effective in persuading management that *Cryptosporidium parvum* was indeed a potential problem. At one point Mr. Allen used *Cryptosporidium parvum* to demand from Mr. Katzell that bottled water be delivered to the ground water plant, because Mr. Katzell could not prove there was no *Cryptosporidium parvum* in the ground water. This request was not acceded to.

Mr. McEwen indicated that, at some time in 1999, he received a visit from Mr. Allen after receiving from him several e-mails related to plant matters. During this conversation Mr. Allen raised with him the fact that in his opinion, his supervisor (Mr. Katzell), was not aware that chlorine would not eliminate *Cryptosporidium parvum* from drinking water. Mr. Allen also informed him that there was *Cryptosporidium parvum* in the river water, and that if he made this public the city would be put to a lot of expense to commence testing for *Cryptosporidium parvum*. Mr. McEwen indicated that he took the matter up with Mr. Berry, his director of public works and utilities, who followed up with the operator and reported back that Mr. Allen was not contending there was *Cryptosporidium parvum* in the city's treated water. Mr. Berry further went on to advise Mr. McEwen that the surface water plant was designed to deal with *Cryptosporidium parvum.*

Mr. Allen knew a little bit about *Cryptosporidium parvum*, but he never did raise it with management as a safety issue unrelated to some other objective he was pursuing with respect to occupational health and safety matters or general labour matters. It is not clear he fully understood the threat posed by *Cryptosporidium parvum* in the surface water treatment plant.

In an e-mail on September 20, 1999, Mr. Allen also brought operator occupational health and safety to the attention of the local member of the legislative assembly. On September 23, 1999, he went further and e-mailed Dale Goldhawk of CTV television to express his frustration with the lack of progress on what he regarded as serious health and safety issues at the plants department. This e-mail stated in part:

> I am having problems at work to get health and safety concerns to be addressed. Methods I have tried so far include approaching my supervisor, the City engineer, the City commissioner, the Mayor, a city counsellor, my union, Occupational Health and Safety (who did issue an order #AN_OR_30399) and even my local member of the legislature. The plethora of problems that I have pointed out have got me "labelled" ...I'm causing problems for the city or I'm so negative.
>
> The problem I feel boils down to "safety versus savings" ....I am further angered when I point out management compromised water quality and I am insubordinate for pointing it out. I am looking for a non-confrontational way to change this situation at the City of North Battleford—please could you suggest a resolution.

A copy of this e-mail was forwarded by Mr. Allen to Mr. McEwen, the city commissioner. Mr. Allen was advised that his services with the city would no longer be required and that he would be offered a buy-out. He was given one week to think about it and in the interval an agreement was drawn up providing for a payment to him of $8,000 if he left the employ of the City of North Battleford effective November 4, 1999. He declined to resign.

The foregoing e-mail to Dale Goldhawk became known to city administration and resulted in a warning letter being forwarded to Mr. Allen from the city commissioner on November 9, 1999. This reply stated in part:

> This letter must be understood to be a firm warning that certain behaviours of the past must be changed. These behaviours are noted to have been:
>
> ...
>
> - uncontrolled, argumentative and confrontational behaviour demonstrating a lack of respect for authority and colleagues and bordering on insubordination
>
> - direct communication of concerns outside and beyond City authority without prior communication with the employer

> - inappropriate expressions of concern for safety without assuming sufficient responsibility to participate in the resolution of such matters.
>
> Continued actions of this nature must, in future, lead to discipline.

The letter then went on to identify expectations of the city administration if Mr. Allen wished to continue his employment with the City of North Battleford. The items identified were as follows:

> 1. That where, in your role as the employee Co-chair of the workplace Occupational Health and Safety Committee, you find it necessary to communicate your concerns, you shall have first clearly demonstrated:
>   - your efforts to be part of a workable solution
>   - your action to have documented such workable solutions and the results of such efforts after a reasonable passage of time
>   - your action to document that you have communicated your need to go beyond the workplace to resolve your concerns and that no resolution has been proposed or refused.
> 2. That in all instances, when directed by a supervisor, to following instructions as a faithful and loyal employee fulfilling all legal directions without bitterness or rancour.
> 3. That you will conscientiously provide constructive responses to direction and requests and that "outbursts of confrontational behaviour" will be eliminated.
> 4. That where you require employer support for time to attend to medical or dental help, you will be prepared to document your use of time for such purposes.

> 5. That you will first obtain permission where you seek to conduct Union or OH & S activity during duty hours.
>
> 6. That you will demonstrate a positive attitude within the workplace and seek and undertake projects of improvement when other duties are fulfilled.
>
> 7. That you will demonstrate a positive and constructive approach and attitude with your colleagues in the workplace.
>
> Clearly we believe these expectancies to be reasonable for you and any other employee. We trust that in future you will give us cause to celebrate your conscientious fulfilment of these expectancies and that you will do the work necessary to build trust and confidence in your abilities among your colleagues and with your supervisor.

Mr. Allen replied in a letter dated November 25, 1999, as follows:

> Further to your letter of November 9, 1999, I deny all allegations made against me and would point out that I am not the employee co-chair of the Workplace Occupational Health and Safety Committee.
>
> I am, however, prepared to follow normal workplace rules and procedures that would allow me to carry out the duties of my position in a positive and constructive manner.
>
> I request that this letter be placed in my personnel file to act as a reply to the letter of warning.

Mr. Allen stated that, as a result of his experiences in the fall of 1999, he did not cease to pursue what he regarded as necessary improvements in occupational health and safety matters, but he did not thereafter seek to advance his concerns in the same political way. He stated that he followed orders as requested and without challenge. He stated he might have made more fuss about the lack of settling in the SCU in March/April, 2001, but for the fact he had applied for the foreman's job in the plants department at the time, and did not wish to cause trouble for himself or his chances of becoming foreman by insisting that the surface water treatment plant not operate.

There is a suggestion in the evidence, that was not pursued to any great extent, that there was also a division of opinion amongst operators, between the more senior operators who had less formal education and Mr. Hollman and Mr. Allen who had engineering technologist, or equivalent, certificates. The senior operators did not see any problem with operating the surface water treatment plant when the vari-drive was removed in February, 1999, or in March/April, 2001, when no settling was being achieved in the SCU.

The foregoing discussion of Mr. Allen's involvement with city administration provides an insight into labour/management relations in the year 1999. Mr. Strelioff indicated that after he arrived at the city he apprised himself of occupational health and safety concerns in the year 2000, and felt that he made an effort to address them, even if he did not proceed quite as quickly as Mr. Allen might have wished.

When Mr. Strelioff took over the job there were a number of occupational health and safety issues that had been raised by plants staff, and there were labour/management issues as well. Mr. Strelioff immediately took an interest in these matters and commenced attending all occupational health and safety meetings. At these meetings general operational issues, not directly related to occupational health and safety, were also discussed. Mr. Katzell testified that:

> There was – there was a lot of strong emotion involved with them, and he stood in there and he dealt with them, and – and actually I really was really grateful that he did, because by that time my candle was burnt out.

In the aftermath of the Walkerton, Ontario, *E. coli* outbreak, Mr. Strelioff used the occasion of an occupational health committee meeting on June 7, 2000, to indicate that a new minimum standard for chlorine residual in the finished water ready to be pumped to consumers should be established above the minimum provincial guideline amount of 0.1 free chlorine residual. He indicated he was not aware of what that limit should be, but took the advice of those present in deciding that the minimum guideline would be raised to 0.25 milligrams per litre of free chlorine residual leaving the plants. At this same meeting it was noted there was a problem in maintaining chlorine residuals in the city's reservoirs during periods of low water demand.

On January 12, 2001, the operators of the plants department forwarded a letter to city council and supervisory staff. The letter stated:

> Subject: Operator's Concerns
>
> It is the intent of this memorandum to inform city council and the supervisory staff responsible for plants operations of the concerns of the operational staff.
>
> An abbreviated list of some of these concerns is as follows:
>
> - The overall conditions including structural, mechanical, safeness, operation sustainability, and general effectiveness of all three plants and associated facilities.
> - The lack of inventory and equipment to conduct proper preventative maintenance of all systems.
> - Occupational Health and Safety issues needing to be addressed.
> - No qualified and certified supervisor on staff.
> - Assistant operator's and plant operator's duties and responsibilities.
> - Continuing education and upgrading courses.
>
> The staff of the plants department greatly look forward to discussing these issues with city council, supervisory staff, and other concerned parties, and look forward to their concerted co-operation in solving these concerns.

The city did not formally respond to this letter. Mr. Strelioff indicated there was nothing in the January 12, 2001, memorandum from the plants staff that was not already known to him.

City council had planned a retreat for January 13 and 14, 2001, which probably prompted the letter from the plants department. The January 12 letter from the operators was not a topic of discussion at the retreat. The minutes of the retreat indicate that, of eight different topic areas, infrastructure was the number one issue of importance to administration personnel and councillors present. The sewage treatment plant, increasing well production, and financing these improvements were identified as priorities for the next three years. It should be noted that the city had experienced the September, 2000, coliform event that had resulted in the issuance of a precautionary drinking water advisory (PDWA). This event will be discussed more fully later, but it did alert councillors to the desirability of increasing production from the ground water plant with a view to reducing the city's reliance on surface water to meet its needs.

As a follow up to this retreat, on February 22, 2001, the city applied for a Canada-Sask. Infrastructure Program Grant in the amount of $400,000 to enable it to drill two new ground wells. This application identified the project benefit was to restore production from wells back to 80% of the city's drinking water requirement from the current 57%. In fact, four wells were eventually drilled in the year 2001, for the same money.

Mr. Strelioff's efforts to replace Mr. Katzell as foreman of the plants department began with an advertisement for the position in four newspapers. On January 18, 2001, the position was offered to an applicant who at first accepted, but then changed his mind and declined. The position was next offered to a senior operator in the plants department on February 19, 2001. After two weeks on the job, this person stated his health was being affected by the responsibility and he asked to revert to his former position, which he did effective March 4, 2001. At this point Mr. Strelioff sought council's approval to increase the salary for the position and to change the title of the position from foreman to manager. The authorization process took several weeks and the next advertisement was published on March 26, 2001, with a closing date of April 19, 2001. As a result of the *Cryptosporidium parvum* outbreak in April, 2001, interviews for this position did not take place until May 31, 2001. Mr. Strelioff soon learned that three of the best applicants for the position had applied for jobs with SERM and did not wish to commit themselves until they knew the results of their SERM applications. The job was then offered to another internal candidate on July 4, 2001. This candidate decided not to accept the position. Subsequently, one of the candidates who had applied for a SERM position became available and was hired effective August 13, 2001. This person has a Class III water treatment and a Class II wastewater treatment certification and had previously been employed in a supervisory position at the Yorkton water treatment plant.

Mr. Strelioff indicated that the balance of the year 2001 was taken up with remediation efforts at the surface water treatment plant and the water distribution system. These remediation matters will be dealt with later.

Mr. James Toye took over as city commissioner from Mr. McEwen effective January 1, 2000. Mr. Toye has two years university education, a local government administration certificate from the University of Regina, and a certificate on economic development from the University of Waterloo. Prior to commencing employment in North Battleford, he had occupied the position of administrator of the Town of Kindersley.

Mr. Toye indicated that, when he was hired, council informed him that they wished him to conduct a thorough review of each civic administrative department. He stated he soon became aware that many of the city's facilities, including the plants and other infrastructure, were old, and that major dollars would have to be committed in some of these areas. Mr. Toye had debriefed Mr. Katzell following his letter of resignation, and apart from what was stated in the letter he became aware of Mr. Katzell's concerns on staffing and the state of equipment at the plants.

The budget for the year 2001 had largely been established when Mr. Toye commenced his employment. Mr. Toye testified he was aware that the city would have to become more proactive in spending dollars in the plants department. As a consequence, the 2001 budget doubled the maintenance allocation for the plants. At this time as well $12 million was allocated in the five-year capital plan for a new sewage treatment plant. The capital plan represents the city's wish list and, although indicative of long term goals, does not mean that projects identified will proceed or that sums allocated will ever be spent. Mr. Toye indicated that he had discussed with Mr. Strelioff the merits of a retrofit as opposed to a new plant. They concluded that, based on the projected growth of the city, a new plant was the more desirable option. Interestingly enough, the location of the sewage treatment plant upstream from the surface water plant does not appear to have been a factor in this decision. The $12 million capital budget item represented an increase from the $5 million that had been put in the capital budget in 1998. Mr. Toye indicated that, with the events of 2001, no action was taken on ordering the design of a new sewage treatment plant, but that such a design will be undertaken in 2002 with a view to completing construction of a plant in the year 2004.

Mayor Wayne Ray became an alderman in the City of North Battleford in 1988. He was elected mayor in 1997, and re-elected in the year 2000. The role of mayor in the city is a part-time position. Mayor Ray's background is a financial one and he presently operates a financial consulting business.

Mayor Ray indicated that shortly after his election he organized a retreat in January of 1998, for the purpose of allowing senior administrators in the city to advise council on the needs of the city and the direction it should take for the next three-year period. One of the outcomes of this retreat was the establishment of a public works committee to allow administration and councillors to discuss issues of a capital nature on an ongoing basis. As noted above, a second retreat took place in January, 2001. Mayor Ray stated there was no suggestion in any discussion at this retreat that the drinking water of North Battleford was unsafe.

Following the events in Walkerton, Ontario, the regional manager for SERM wrote to communities in the Parkland EcoRegion to emphasize the importance of maintenance and monitoring of potable water supplies and the importance of bacteriological testing on a regular basis. North Battleford city council took exception to the letter, which the mayor described as a "cover your butt" letter. At the same time city council had issues of solid waste management that it did not feel were being given proper attention by SERM. Mayor Ray, at the direction of council, wrote a letter to SERM dated June 13, 2000, in which he stated in part as follows:

> We certainly understand and take our responsibility to provide safe drinking water to our citizens. The City of North Battleford has regularly tested our water and our staff have been very professional and diligent in their examination procedures.
>
> Your letter certainly alerts communities as to the need for ensuring safe drinking water for their citizens. We were dismayed in concluding that SERM is not aware of the procedures we use in our community to ensure safe drinking water.

Mayor Ray testified he had written the foregoing letter more on faith than as a result of any particular inquiries he had made at the time about the state of the city's water system or operational procedures at the plants.

Mayor Ray indicated he had little or no contact with plant operators over the years and would only see Mr. Katzell on social occasions such as the annual Christmas party. He stated he would have informal discussions with the director of public works and utilities from time to time apart from formal council meetings. However, his main contact was through the city commissioner.

Mayor Ray made the point that the role of a city councillor is general policy and budget, and not operational issues. He confirmed there was a strong consensus on council at the time Mr. Strelioff was hired that, if it was a choice between an engineer and a person with a strong managerial background, council would prefer the latter. He did not recall any of Mr. Katzell's staffing or operational concerns with respect to the plants department ever being raised with him or at any meeting he attended. He recalled that the Pommen report referred to above was received by council but did not generate much discussion. It was viewed as a document produced to assist the administrators. Likewise, the Reid Crowther report did not generate much discussion at council level beyond how to structure in the financing for a new plant. Mayor Ray indicated no one had ever specifically advised him of the fact that the location of the sewage treatment plant upstream from the surface water treatment plant was a problem.

FINDINGS

18. Throughout the 1990s, the city council of North Battleford and its administrators minimized the amount of money they were prepared to spend on the plants department.

19. Senior management of the city, but not city council, knew Mr. Katzell, the long-time foreman, had concerns about the state of infrastructure and equipment in the plants department, and that he considered the department to be under-staffed, but they chose to do nothing about it.

20. Both city council and senior management of the city chose to ignore operator concerns as reflected in the January 12, 2001, letter, although the concerns were subsequently proven to have merit.

21. Throughout the 1990s no one in senior management or on city council had sufficient, if any, knowledge of water treatment processes to appreciate or understand the health risk posed by the surface water treatment plant, bearing in mind its source of raw water, and the aged state of its equipment and infrastructure.

RECOMMENDATIONS

5. That the City of North Battleford prepare a written safe drinking water policy that commits to the principle of quality of water over quantity of water, that commits to maintaining best industry practices in its water treatment plants, and that encourages the manager of the water treatment plant to report directly to city council whenever he has concerns that affect the safety of drinking water that are not being addressed by city administration officials.

6. That one of the committees of city council be assigned responsibility for implementing the city's safe drinking water policy.

7. That this committee receive from the manager of the water treatment plant a written report quarterly on the operations of the water treatment plant during the previous three months. Said report should include the results of all sampling conducted during the period, any non-compliances with the operating permit, and any other types of problem that an oversight committee would be interested in hearing.

8. That the subcommittee of council prepare a report annually for city council on the state of drinking water in the city, which report shall be part of the public record.

6. Funding and Utility Rates

In the five years between 1996 and 2000, a total of $46,908 in capital expenditures was made on the surface water treatment plant. No capital expenditures were made with respect to the ground water plant or new wells, and $3,422 was spent on the sewage treatment plant. During this same five-year period $976,831 was spent on the water distribution system and $776,000 was added to water utility reserves, which at the end of the year 2000 stood at $1,216,865 including a fund described as "utility fund surplus." The water plants, wells, tower, and reservoirs portion of the reserve was $714,941. The 2001 budget contemplated spending $465,000 on new wells for the ground water plant.

During this same five-year period the sewage treatment plant contribution to reserves was $596,935. The total reserve at year end 2000, was $1,144,835 in the sewage plant reserve, $118,100 in the sewage main replacement reserve, and $85,178 in a sewage fund surplus.

The net operating costs for the water utility declined $10,000 from $1,062,323 in 1996, to $1,050,929 in 1999. In the year 2000, operating costs increased to $1,225,252 as a result of increases recommended by Mr. Toye, and to some extent as a result of the cost increases from the PDWA issued in September, 2000. The costs of operating the sewage treatment plant during the same five years increased from $467,929 in 1996, to $576,700 in the year 2000.

A utility rate comparison issued in July, 2001, for 13 Saskatchewan cities indicates that, with respect to water only, North Battleford has the lowest rate for a minimum user, is fourth lowest for an average user, and fourth lowest for a high user. The combined rates for sewer and water rank North Battleford number one for a minimum residential user, number three for an average user, and number four for a high user. There was no increase in water rates in North Battleford for the four years from 1997 to 2000, inclusive, nor in the sewer rates, which were 60% of the amount charged to the consumer for water. Increases in the water rate for the seven years prior to 1997 was 5¢ per 100 m3, or an approximate 7.1% increase. This increase represented the whole increase in sewer and water rates for the decade of the 1990s.

FINDINGS

22. Knowing the aged state of its infrastructure, the City of North Battleford kept its water utility rates artificially low throughout the 1990s.

RECOMMENDATIONS

9. That the City of North Battleford raise its water utility rates at least to the median level of the rates charged by the 13 Saskatchewan cities.

7. September 2000 Coliform Event

In September, 2000, the administration of the City of North Battleford, as well as the regulator, SERM, obtained an insight, or should have, into the fact that all was not well in the water utility in North Battleford.

On August 31, 2000, the provincial laboratory advised SERM, pursuant to a bacteriological follow up protocol that will be reviewed later herein, that a routine sample from the North Battleford water distribution system had a total coliform count of 1 organism per 100 millilitres of water. The sample site was from 99th Street in the city, a dead end portion of the water distribution system. SERM notified the local resource officer and the Battlefords Health District by e-mail on September 1, 2000. Mr. Meekma, the local environmental protection officer for the Parkland EcoRegion of SERM, thereafter telephoned Mr. Katzell. He advised him of the positive sample, requested that he increase the chlorine levels in the distribution system, and requested that he submit a second sample from the same location.

Mr. Katzell did not submit the sample until September 5, 2000. On September 8, 2000, the provincial laboratory advised the coliform count was 2 organisms per 100 millilitres. Both this and the earlier sample tested negative for fecal coliforms and *E. coli.* Mr. Meekma telephoned Mr. Katzell that day and advised that, pursuant to the protocol, three repeat samples must now be taken; one from the same location, one upstream, and one downstream. In the end, Mr. Katzell submitted two samples only; one from the same location, and one upstream. The sample taken from the same location was tested on September 14, 2000, and showed a coliform count of 1 organism per 100 millilitres. The upstream sample was negative.

The form used to submit samples for bacteriological testing also requested that a chlorine reading and turbidity reading from the water sample be included. Mr. Meekma noted that chlorine residuals shown on the form for the first two samples were below the 0.5 milligrams per litre for free chlorine residual required by s. 23(4) of the regulations. On September 8, Mr. Meekma requested the SERM data unit in Regina to print the bacteriological results and the chlorine residuals recorded to date for the year 2000. On the morning of September 14, he received this information which showed that 71% (74 out of 104) of the chlorine residuals recorded on the forms were below the regulated standard. On this date Mr. Meekma advised the public health unit that he was calling a meeting for that afternoon with the city to discuss the situation and invited their participation.

The meeting took place in the city council chambers on the afternoon of September 14, 2000. The city representatives present were Mayor Ray and two city councillors, Mr. Strelioff, Mr. Toye, and Mr. Katzell. Public Health was represented by Dr. Gerhard Benadé, the medical health officer for the district, Mr. Richard Koruluk, senior public health inspector, and Mr. Roger Piatt, a public health inspector. Mr. Meekma represented SERM.

At this meeting, when it was pointed out just how low the chlorine results had been over the previous nine months, Mr. Katzell informed the group that he thought the chlorine levels "were fine." This greatly alarmed Dr. Benadé and the public health inspectors present as well as Mr. Meekma, because the whole purpose of legislating chlorine levels in a water distribution system is to ensure that bacteria will not grow or survive in the system and this point did not appear to be appreciated by Mr. Katzell. Dr. Benadé went so far as to say in his testimony that it was his impression the city officials, including Mr. Katzell, were not even aware of the legislated chlorine levels that must exist in the system, and at one point the regulations were produced in order to put that issue to rest.

At the hearing, Mr. Katzell testified that he had always been the person who dictated the amount of chlorine that should be placed in the water distribution system. He explained that he had for years deliberately minimized the amount of chlorine placed in the system. Mr. Katzell testified:

Q Right. And I think Mr. Piatt had testified that he did inquire as to whether the chlorine levels in the City were Okay and –

A Hmm–Hmm.

Q I believe his testimony was that you'd said yes – they were, as far as you – as far as you are concerned

A As far as I was concerned, yes, they were, yeah.

...

Q The question I'd like to ask you is, well, we've concentrated on that particular period of time, did you also run the chlorine levels at a lower requirement at other periods of time before the year 2000?

A Oh, yes – yes, they – they – that was – that – yes, they were – they were lower, yes, in previous times, yes.

Q So how long had you – how long had you done that?

A For a number of years – for a number of years I did and because, when I tried to raise them higher and I did, I tried to raise them higher, it caused a whole host of problems that – that were very difficult to deal with so I kept on backing them down until – until these other difficulties became manageable.

Q Right.

A And – and yeah – it wasn't an easy choice to make and it was – it was something I had to do and the – the thing that I relied on – one of the things that I relied on were the – were the test results that came back from the provincial lab from the samples that we sent in. The – the bacteriological results indicated to me that, although our chlorine levels were low, the water was safe – so during – but – but let me reiterate, I was still concerned – yes.

Mr. Katzell explained that he minimized the amount of chlorine in the system for two reasons.

He testified that the ground water plant produced water that was very high in iron and manganese. The filtration system at the ground water plant effectively dealt with the iron in the water, but not the manganese. For this reason a sequestering agent was introduced in the water to hold the manganese in suspension to avoid it corroding the water pipes in the distribution system. Mr. Katzell discovered over the years that if too much chlorine was added to the water in the distribution system it oxidized the manganese with the result that laundry would become stained with a brownish colour. This staining had been the subject of numerous complaints over a period of years.

The second reason for minimizing the chlorine levels was that chlorine residuals dissipate in the water distribution system over time and distance. He was concerned that too much chlorine in the water as it left the plant resulted in complaints from consumers who were proximate to the surface water treatment plant. At one point, one of the operators paraphrased Mr. Katzell's statement to the effect that he did not want consumers at the front end of the system to be drinking "Javex" in order to meet the chlorine residuals required at the far end of the distribution system.

At this meeting on September 14, the question arose whether a PDWA or boil water order should be issued. The decision was made that because the contamination was limited to a dead end in the distribution system, there were no positive bacteria samples from any other of the five sites in the distribution system, and that there was no known increase in enteric disease in the community that the city should proceed to flush the system and take more samples before such a decision was made.

As Dr. Benadé pointed out in his testimony, the issuing of a PDWA, or a boil water order, is a very significant event requiring a great deal of logistical activity, and a significant amount of business and household disruption. As Dr. Benadé put it:

> And keeping in mind that, you know, issuing an advisory is a significant decision, it is not something you do, you know, over a beer and some peanuts and then go home. There are major repercussions for business, public alarm. It requires a huge resource commitment and there are some legal issues as well, if you get it wrong.

On the afternoon of September 14, 2000, the public health inspectors collected eight more samples of water from the distribution system, all of which had below standard chlorine residuals and sent them away for analysis.

This group met again at 9:00 a.m. on Friday, September 15, 2000. At this meeting, Mr. Mark Getzlaf, the manager of SERM's Parkland EcoRegion that includes North Battleford, and Mr. John Yarske, chief executive officer of the Battlefords Health District, joined the original group. Mr. Strelioff offered a progress report on the city's actions in flushing out the water distribution system and advised the chlorine levels had been increased. The results of the previous day's samples with respect to the presence of coliforms were not yet known. It was decided the group would adjourn and meet again at 4:00 p.m. when it was understood preliminary results from the samples would be known. At 11:00 a.m. that day Mayor Ray and Mr. Strelioff held a press conference to advise the citizens of North Battleford informally that the city may have a problem with its water. At the meeting at 4:00 p.m. the results of the September 14 samples were not yet finalized and would not be so finalized until 11:00 p.m. that evening but preliminary results showed signs of coliform counts. Mr. Strelioff reported that chlorine levels taken from the 99th Street site between the meetings still failed to meet the regulated standards. The group decided that persistent low chlorine levels had been present in the system for a sufficiently lengthy period of time to justify a formal PDWA be issued on the strong recommendation of SERM.

The PDWA was issued via a media release at 5:00 p.m. on September 15, 2000, and thereafter follow up notifications were made in accordance with the bacteriological response protocol. The PDWA was removed at 7:00 p.m. on September 19 when the samples taken from the afternoon of September 14, turned out to be negative for coliforms, and testing of the water distribution system in the interval established that chlorine levels in the system were above the regulated amount of 0.5 milligrams per litre.

On November 23, 2000, Mr. Meekma sent a letter to Mr. Strelioff as a follow up to a meeting he had with him on October 24, 2000, with a copy to Dr. Benadé. This letter stated in part:

> Therefore it was agreed that the following investigations would be initiated and that the results of the investigations, including follow up actions required, be documented in a report and submitted to the Department by March 15, 2001.
>
> 1) Distribution system hydrology study.
>
> 2) Plant #2 (surface water) performance evaluation.
>
> It is presumed at this time that the surface water treatment plant may be a concern, however, should the results of the hydrology study identify that this presumption is incorrect then a performance evaluation of the ground water plant should be initiated. (The colour, turbidity, iron and manganese

would be excellent parameters to monitor in defining the presence of the two treated waters in the distribution system).

3) Final treated water "Quality Assurance and Quality Control plan (QA/QC)."
The QA/QC plan should also include a response to any upset conditions that could be realized throughout the water treatment plant and distribution systems operations.

In summary, the intent of the investigations is to develop a meaningful routine monitoring plan that will address normal day to day operations and to have in place an emergency response plan that can be implemented to address upset conditions.

It was agreed that the City, in the interim, will monitor 15 locations within the distribution system and submit 30 bacteriological samples a month until results of the investigations are complete.

Mr. Meekma testified that the hydrology study that he requested in the foregoing was to ascertain the flow of water in the distribution system to determine, in the event of a future contamination event, whether it was necessary to issue a PDWA for the whole city as opposed to only a portion of the system. He stated the performance evaluation requested for the surface water plant was to learn if the plant's processes were operating optimally to remove organic material and lower turbidity, because the cleaner the water the easier it is to maintain chlorine residuals. The Quality Assurance/Quality Control manual was requested in order that standards be established not only for routine monitoring, but also upsets, which if they occurred, would result in the shutdown of the plant.

The city did not comply with any of the requests prior to March 15, 2001, or indeed prior to the April outbreak. Mr. Strelioff did commission the water distribution study in December, 2000, but it was necessary to wait until spring to finish this study. Mr. Strelioff had advised Mr. Meekma of this fact and obtained an extension in this respect. Mr. Strelioff had also contacted Mr. Meekma after the letter to state he did not know where to start with the Quality

Assurance/Quality Control manual. Mr. Meekma forwarded to him a copy of the City of Saskatoon treatment plant manual for his reference. Mr. Meekma stated he assumed this manual would be prepared in-house and was surprised when he did not receive it by March 15, 2001, but did not follow up on it. The performance evaluation of the surface water plant does not appear to have been a topic between Mr. Strelioff and Mr. Meekma after the request of November 23. Such an evaluation was not requisitioned by the city.

Mr. Meekma testified he was not concerned when the March 15 deadline was not met because the bacteriological samples being reported from the city had all been negative in the interval. He did not have any contact with the North Battleford plant thereafter prior to the outbreak.

Mr. Meekma learned in January, 2001, that Mr. Katzell, the foreman of the plant, had retired in December, 2000. He stated he knew Mr. Strelioff was taking over Mr. Katzell's role pending the hiring of another foreman, and he agreed he did not know if Mr. Strelioff was qualified to do so. Mr. Meekma agreed that he would expect the operators to be supervised by a qualified person, and he agreed that it was important that operators be supervised. It did not occur to Mr. Meekma that this lack of supervision should be reported to anyone. He stated he had no reason to doubt the competence of the operators of the surface water plant. It should be stated that Mr. Meekma is not a water treatment specialist, and in the role he had been assigned by SERM he was not expected to involve himself in water treatment plants unless there was a bacteriological problem. As he stated, he did not regard himself as a regulator of safe water but a regulator of bacteriological sampling only.

Mayor Ray was asked if he was informed of the contents of the November 23 letter from Mr. Meekma. He stated he was and that he left it to administration to update him on a regular basis. He was asked:

> Q Okay. Were there any reports made to City council on that letter and any – any follow up to that letter?
>
> A There was a report – or various reports and updates through the inquiries of City council, yes.
>
> Q Okay. And were you satisfied with the progress that was being made?

A Yes.

The question may be asked whether, with respect to a subject as important as the safety of drinking water, a regulator's request that the surface water treatment plant undergo a performance evaluation which goes unheeded for five months is acceptable. It is not. Unfortunately the foregoing response is consistent with all of the other evidence on the city's attitude toward the water treatment plants which failed to appreciate the health aspects of safe drinking water. The fact that this answer was provided at the inquiry one year later, and after the April, 2001, outbreak, is cause for concern as to whether any lessons have been learned.

FINDINGS

23. Both the City of North Battleford and SERM were aware there were no quality control or quality assurance guidelines for the surface water plant operation, and no qualified supervisor at the plant from the time Mr. Katzell retired on December 14, 2000, to the outbreak of cryptosporidiosis in the city in April, 2001.

24. The City of North Battleford's mayor and senior administrators remained indifferent to the public health safety aspects of drinking water following the September, 2000, coliform event

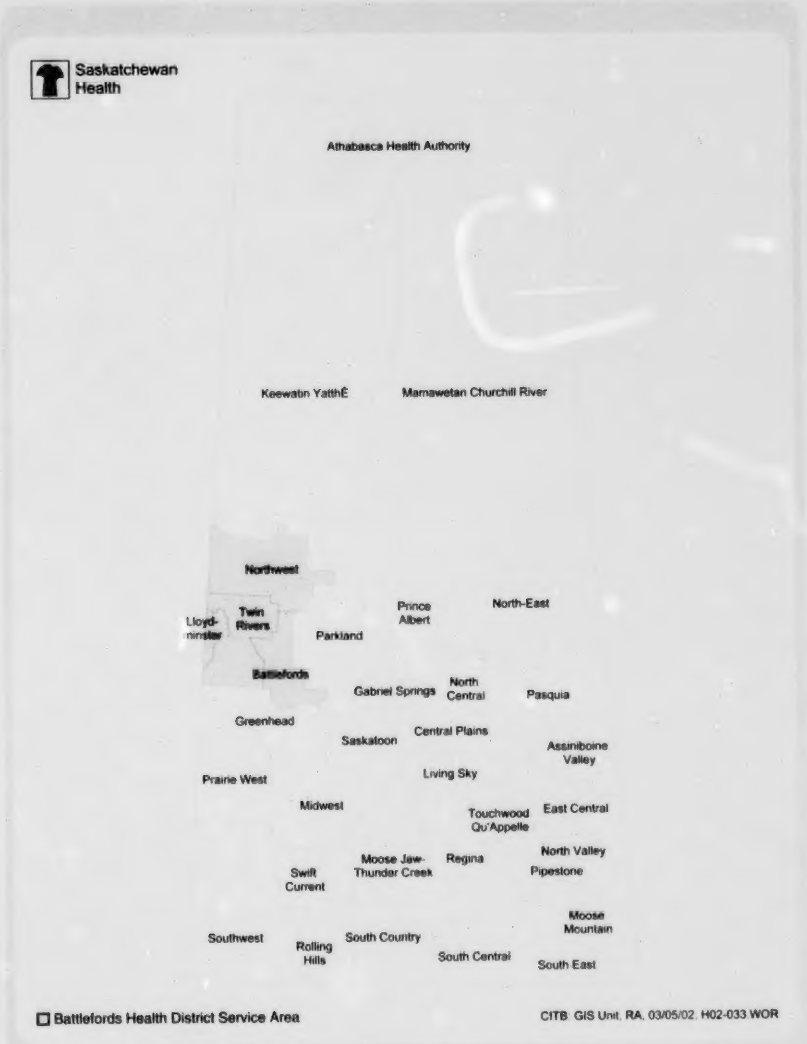
PART III - THE BATTLEFORDS HEALTH DISTRICT

The Province of Saskatchewan is divided into health districts in accordance with *The Health Districts Act*, S.S. 1993, c. H-0.01. The health districts provide all medical services required within the geographical area including hospitals, ambulances, long-term care homes, and most relevant to this inquiry, public health services. Since 1994, health districts have had primary responsibility for investigating and managing health issues/health events within their borders.

For the purpose of administering *The Public Health Act, 1994*, S.S. 1994, c. P-37.1, s. 6 of the *Act* states a district health board may be appointed a local authority. Section 10 of the *Act* provides that a local authority may delegate to a public health officer any of the powers and responsibilities that are given to the local authority by the *Act*. Section 11 of the *Act* provides for the appointment of public health officers.

The Battlefords District Health Board was appointed by the province in 1996 to be the local authority for the geographical area comprising the Battlefords Health District, Twin Rivers Health District, Lloydminster Health District, and Northwest Health District. This is a very large geographical area as displayed in the following map:

Fig. 10
HEALTH DISTRICTS MAP
SASKATCHEWAN


Saskatchewan Health
Athabasca Health Authority
Keewatin YatthÊ
Mamawetan Churchill River
Northwest
Twin Rivers
Lloyd-minster
Parkland
Prince Albert
North-East
Battlefords
Gabriel Springs
North Central
Pasquia
Greenhead
Saskatoon
Central Plains
Assiniboine Valley
Prairie West
Living Sky
Midwest
Touchwood Qu'Appelle
East Central
North Valley
Moose Jaw-Thunder Creek
Regina
Pipestone
Swift Current
Moose Mountain
Southwest
Rolling Hills
South Country
South Central
South East
☐ Battlefords Health District Service Area
CITB GIS Unit, RA, 03/05/02, H02-033.WOR

Source: Government of Saskatchewan
Saskatchewan Health

Dr. Gerhard Benadé, in 1996, was appointed public health officer. The Battlefords District Health Board recommended him for this position. In the same year the Battlefords Health District delegated to him all of its powers and responsibilities as local authority under the *Act*, regulations and its own by-laws.

The public health officer performs the statutory duties required of a public health officer under *The Public Health Act, 1994* and all related legislation. One major role is epidemiological monitoring and disease surveillance. There are 70 communicable diseases that are to be tracked and monitored, as well as non-communicable diseases such as diabetes. Section 14(3) of *The Environmental Management and Protection Act*, S.S. 1993-94, c.E-10.2 (EMPA) provides:

> 14(3) The medial health officer of a municipality shall be an adviser and consultant to the minister with respect to matters respecting public health relating to water and sewage within that municipality.

The medical health officer is the person designated as public health officer in most health districts.

Under the jurisdiction of the medical health officer, each health district has public health inspectors. The mandate of the health inspectors is summarized in an annual report as follows:

> Under the Public Health Act, the local authority has a mandate to protect the public's health by ensuring that communicable diseases, especially those related to food and water and environmental hazards, are reduced. The Public Health Inspectors, who are appointed as Public Health Officers, accomplish this through the following activities and interventions:
>
> (a) monitoring and surveillance, which includes site inspections, surveys, sampling, and testing.
>
> (b) education, which includes formalized courses such as the Saskatoon Food Handler Training Program to target groups and disseminating of health and safety information to the general public.

(c) investigations of health related complaints and the follow up of communicable disease events.

(d) assist in the development of provincial policies, guidelines and legislation specific to environmental health issues.

Among the duties performed by the inspectors is the enforcement of regulations under 11 different provincial statutes. In addition, in the most recent year the inspectors were responsible for inspecting compliance activities in 1,349 public facilities, most of which required annual inspection as part of a licensing process.

The public health inspectors are also responsible for monitoring and ensuring compliance with health regulations for all non-municipal waterworks that produce under 18,184 litres per day. In the year 2000, there were 162 such water-related facilities made up of 111 public wells, 29 communal water systems, and 22 water bottling facilities.

Prior to June, 2000, the health district would only become involved with a SERM inspected waterworks (over 18,184 litres per day) if there was a suspected or confirmed health hazard from a licensed water supply system. Public health inspectors do not have the level of expertise or specific training required to monitor water or sewage treatment plants.

Public health inspectors also play a critical role as investigators of potential food-borne and water-borne disease pursuant to *The Communicable Disease Control Regulations, 1997*. When a communicable disease is reported by the provincial laboratory to a health district, it is the public health inspectors who follow up as required by the regulations. Public health related complaints and communicable disease investigations are the number one priority in a public inspector's daily work load.

The evidence establishes public health inspectors are in very short supply in Canada. The Battlefords Health District complement of public health inspectors is five, made up of a senior public health inspector plus four inspectors. In April, 2001, there were two vacancies which had still not been filled as of November, 2001. The vacancies were in Meadow Lake and Lloydminster and this has required the three inspectors located in North Battleford to travel to both Meadow Lake and Lloydminster to perform the duties required.

The other professional group involved in community health is the public health nurses. They have their own heavy work load and do not become involved in assisting public health inspectors with their duties. The follow up for sexually transmitted disease is performed by public health nurses. The follow up required for all enteric disease is assigned to the public health inspectors. A public health nurse acts as the communicable disease coordinator for the Battlefords Health District.

As indicated earlier herein, *Cryptosporidium parvum* has not been a significant problem in the Battlefords area since at least 1994. In 1999 and the year 2000, there were zero cases in the geographic area comprising the Battlefords Health District, although there were one or two cases in other districts for which it acts as host. In the province there has not been a documented case of a large scale outbreak of cryptosporidiosis.

1. Protocols Applicable to Communicable Disease in the Province

The "Communicable Disease Control Manual" published by the Province in March, 1999, states at page 1:

> The Province has overall authority for the control of communicable diseases, which is carried out by medical health officers employed by Population Health Branch, Saskatchewan Health. This branch:
>
> - Coordinates the development of provincial standards, policies, and procedures for the control of communicable diseases.
> - Provides consultation to local medical health officers and health agencies as required.

With respect to the role of Saskatchewan health districts who also act as a host health district it states:

> Each host district has an assigned medical health officer who, together with his/her staff, is responsible for the control of communicable diseases in the service area.

The Communicable Disease Control Regulations, 1997 classify cryptosporidiosis as a Class I communicable disease.

The manual addresses the issue of "community outbreak management" and states: "once identified, outbreak management requires a team approach." It also states the outbreak team "would be specific to the outbreak under investigation."

The manual provides general guidelines for investigating enteric diseases. It states as one of the objectives: "to investigate all enteric diseases in a timely manner upon receipt of the report." It goes on to itemize the "role of the investigator," which is generic and makes no specific reference to water-borne disease. It contains a fact sheet on cryptosporidiosis. Under the heading "transmission" is recorded "fecal/oral, including person-to-person, animal-to-person, water-borne and food-borne. Oocysts are highly resistant to chemical disinfectants."

The population health branch of Saskatchewan Health, on October 12, 1998, published a "Provincial protocol for coordinated response to significant disease outbreaks and other public health threats." In the background section it is stated:

> 'Emerging Infections' is a term applied to new and re-emerging infectious diseases. These include Ebola, Hantavirus, HIV/Aids, Lasa Fever, Swine Flu, Legionnaires' Disease, Cryptosporidiosis, Tuberculosis, etc.

The document goes on to identify public health situations potentially requiring an emergency response. It states:

> Public health issues and events which may require assistance from Saskatchewan Health include the following:
>
> 1. Communicable disease outbreaks, particularly those requiring significant containment and control response, community quarantine, or detailed epidemiological investigation.

The foregoing item is the only one of the items identified that could possibly incorporate water-borne disease.

The Battlefords Health District's policy and procedural manual contains a section on "notification of food-borne and water-borne disease." The purpose of this procedure is simply to encourage the reporting of such disease to the local public health office.

There is nothing in the foregoing protocols directed specifically at what should happen when a water-borne outbreak of disease is suspected as opposed to confirmed. Following Walkerton, a bacteriological response protocol was put in place that was directed primarily at *E. coli* in drinking water. This protocol does not refer to other pathogens and does not deal with investigations. It deals only with the response which should take place when *E. coli* is laboratory confirmed.

2. Protocols for Water-borne Pathogens

As noted from the foregoing, neither the province nor the health district had in place a protocol directed at water-borne pathogens. Guidelines and protocols directed at this topic have been produced elsewhere in recent years. The Working Group on Water-borne Cryptosporidiosis organized by the Centers for Disease Control and Prevention in Atlanta, Georgia, in 1997 published a comprehensive manual entitled "Cryptosporidium and Water: A Public Health Handbook." The manual includes "Guidelines for Issuing and Rescinding A Boil Water Advisory When Cryptosporidium Or Other Water-borne Pathogens Are Suspected." The Guidelines state: "decisions about BWAs, however, must frequently be made within relatively short periods of time and with either incomplete or inconclusive information." The paper goes on to say:

> Therefore the most effective way for a community to make decisions about BWAs is to establish a local task force well in advance of any critical decision-making point to discuss site-specific issues that are critical to BWA decision making. The task force should consist of representatives from water utility, public health, and regulatory agencies. The task force has two principal goals: to bring together inputs necessary to establish local water quality standards, and to establish a review process that would be activated when a question about the safety of local drinking water arises.

The Province of Ontario's Public Health Branch published in August, 1997, a "Protocol for the Investigation and Control of Cryptosporidium and Giardia Water-borne Outbreaks." There is much valuable investigation information in this document. Under the heading "Case Investigation" it states: "it is important to carefully document the sources of water consumed by cases, as well as other possible sources of transmission, as described in the following...." The case history summary form provided allows for the recording of all different sources of water the person might have consumed and the dates. Water sources include:

- urban/rural/community, filtered/unfiltered, ground/surface/combined;

- private wells;
- beverages containing unfiltered water;
- bottled water (brand name).

This protocol makes the point very clearly that persons drink water elsewhere than in their home and it is important to ascertain where and when any confirmed case has done so.

The document goes on to state:

> Based on the experiences of other water system related cryptosporidiosis, giardiasis outbreaks, an outbreak should be considered when:
>
> - there is a marked increase in reported cases over a short period of time (i.e. one or two weeks), especially if this occurs at time of winter thaw/spring runoff;
> - there is an increase in community reports of acute gastrointestinal illness, especially where the geographic area is wide-spread and conforms to a municipal/communal water system distribution; and
> - consumption of municipal water is the predominant common factor with the cases.

Under the heading "Strength of Association Between Cryptosporidiosis / Giardiasis and Water," the following text and table appear:

> Once an outbreak is determined, it is important to assess the likelihood of it being water-borne, particularly if the source affects a community. Any corrective actions or public advisories involving inter-agency co-operation and public or other client acceptance, would be facilitated if the outbreaks linked to water could be demonstrated. The following is an algorithm from the Public Health Laboratory Systems of the United Kingdom which may be of assistance.

Fig. 11
STRENGTH OF ASSOCIATION OF OUTBREAK TO WATER

	Microbiology/Water Quality
A	Pathogen identified in clinical casses is also found in water
B	Water quality failure and/or water treatment problem of relevance but outbreak pathogen is not detected in water
	Epidemiology
C	Evidence from an analytical (case control or cohort) study demonstrates association between water and illness
D	Descriptive epidemiology suggests that the outbreak is water related and excludes obvious alternative explanations.
strongly associated if (A + C) or (A + D) or (B + C); probably associated if (B + D) or (C only or A only; possibly associated if B or D only.	

Source: *Protocol for the Investigation and Control*
of Cryptosporidium and Giardia Waterborne Outbreaks
Safe Water Program
Mandatory Health Programs and Services
Public Health Branch
Ontario Ministry of Health
Exhibit C-27 Tab 8

With respect to outbreak management it also states, "critical to the successful management of a water-borne disease outbreak is the establishment of an Outbreak Management Team." The guidelines point out who might be members of such a team.

The literature supports the view that of the various methods of transmittal of enteric disease, transmittal by drinking water has the potential to affect the largest number of people in the shortest period of time. This fact is what creates the urgency when there is something more than suspicion that enteric disease could be caused by a water-borne pathogen.

FINDINGS:

25. Neither the Province of Saskatchewan or the Battlefords Health District had in place a protocol directed at suspected water-borne outbreak of enteric disease. As a result, the investigators in the Battlefords Health District did not have any guidance on how to proceed with such an investigation.

PART IV - THE *CRYPTOSPORIDIUM PARVUM* OUTBREAK APRIL, 2001

In the month of April, 2001, a large number of persons in the Battlefords area, both North Battleford and the Town of Battleford, as well as the surrounding area, became ill with enteric disease that was subsequently identified as cryptosporidiosis. An epidemiological study, conducted by a team from Health Canada, concluded that 5,800 to 7,100 persons from the Battlefords area, along with hundreds more from other communities and other provinces who had visited North Battleford in the period between March 20 and April 26, 2001, experienced this illness.

On April 26, 2001, a boil water order was issued for the City of North Battleford and surrounding area (Appendix "B"). This order remained in effect until July 25, 2001. During this period of time the City of North Battleford carried out work to flush and disinfect the surface water plant and the water distribution system to meet a standard set in a protocol for removing the boil water order.

1. Investigation

There were no bad bacterial samples submitted by North Battleford between September, 2000, and April, 2001.

As reported earlier herein, the solids contact unit at the surface water treatment plant had been thoroughly cleaned out on March 20, 2001, and thereafter operators had difficulty establishing any settling in the unit until approximately April 18, 2001. As earlier noted, the difficulties with settling in the solids contact unit had not been reported by city officials to either SERM, or the health district.

The first positive case of cryptosporidiosis was reported to the Battlefords Health District by the provincial laboratory on April 4, 2001. Mr. Piatt, a public health inspector (PHI) was assigned the file by Mr. Koroluk, senior public health inspector. Mr. Piatt immediately contacted the family doctor for the child in question. The child lived on a farm approximately 13 kilometres from North Battleford. He then left a telephone message at the home and the child's mother called him back either later that night or early the next morning. Using the new notification of enteric disease form (Appendix "D") as well as another form he had available, he proceeded to question the mother on possible sources for the child encountering *Cryptosporidium parvum*. He learned that the child was exposed to feces from cattle on the farm, and he also learned there was a private water supply which had not been tested for some time. There was nothing disclosed that connected the child to the City of North Battleford, although it did subsequently emerge that the child attended school in Battleford. As noted earlier, isolated cases of cryptosporidiosis were not that uncommon with several occurring on average per year in the North Battleford area.

The second case of cryptosporidiosis reported to the Battlefords Health District was on Thursday, April 5, 2001. As it happened, Ms. Jean Leitner, a public health nurse who also acts as the communicable disease coordinator, was away from the community health office on Thursday, April 5, and on the Friday, Saturday and Sunday which were her days off. Ms. Leitner does not ever work Mondays and therefore it was Tuesday, April 10, 2001, before this report was entered in the log. Under the practice in the office, a PHI is not assigned an investigation until the report has first been entered in the log.

On April 10, Ms. Leitner assigned the file to Mr. Piatt, as the patient lived in Battleford, the area he covered. Mr. Piatt testified he is not certain he ever looked at the form sufficiently to determine that it was another case of cryptosporidiosis. The same day, Mr. Kenneth Startup, another PHI, was in Mr. Piatt's office, and upon hearing of this new investigation, indicated that he knew the family and that he would therefore conduct it. Both Mr. Piatt and Mr. Startup indicated that it is easier to obtain information if you know the family members involved. Mr. Startup was not advised by Mr. Piatt, who probably did not know, that this was the second case of cryptosporidiosis in two days. Mr. Startup did not conduct his investigation until Thursday, April 12, 2001. In speaking to the child's mother, he was not able to determine a potential source, but the mother did mention to him that she had heard there was diarrhoea going around the school that her daughter attended. This child attended St. Vital's School in Battleford and resided in Battleford. Mr. Startup was not certain at the time he testified whether he learned from the mother that her younger five-year-old child was ill with diarrhoea and cramps that had onset the previous day. The enteric disease form questionnaire in use does not specifically have a question as to whether any other members of the family were similarly ill either before or after the person who is the subject of the investigation.

Mr. Startup conducted the interview in this case, but because he was not aware this was the second case of cryptosporidiosis reported he did not learn that the second child was a classmate of the first case investigated by Mr. Piatt. Both children attended St. Vital's School in Battleford. Mr. Startup's reasoning at the time was that in view of diarrhoea in the classroom it was possibly a person-to-person contact that was the potential source for the *Cryptosporidium parvum*, and had he been aware of the foregoing information it would simply have confirmed his hypothesis. It was late on April 12 when he obtained this information from the child's mother. The school was closed on Good Friday, April 13, because it was the Easter weekend, and on the following week for the Easter school holiday. Mr. Startup did not return to work until April 17, 2001.

On April 12, 2001, Dr. Gerhard Benadé received a telephone call at home at approximately 9:00 p.m. from Dr. Geoffrey Lipsett who wished to report to him that one of his patients, a nine-year-old girl, had tested positive for *Cryptosporidium parvum*. This is in fact the case reported on April 5 and the one investigated by Mr. Startup as referred to in the previous paragraph.

Dr. Lipsett testified he had first seen this patient on March 21, when she came in with her mother to have her ears checked and with symptoms of a cold. During the visit her mother mentioned that the child also had some abdominal pain. Dr. Lipsett confirmed that she did, but he stated it was not acute at that time. The child returned with her mother on March 26. Dr. Lipsett testified the mother reported the child had been experiencing stomach cramps and diarrhoea up to 12 times a day for the past six days. The child had not been vomiting, and Dr. Lipsett confirmed that she did not have a fever. Dr. Lipsett requested stool samples, and they were collected on March 27. He again saw the child on March 30, and her cramps had largely disappeared and the diarrhoea had "settled." The provincial laboratory received the stool specimens from the child on March 29, 2001. The lab reported by telephone to Dr. Lipsett's office on April 4, 2001, that the sample tested positive for *Cryptosporidium parvum*. Dr. Lipsett received a copy of the lab results on April 5 or 6.

Dr. Lipsett stated he was not familiar with cryptosporidiosis, and after doing some research he learned that there was no treatment for the condition. He discussed the matter with his partner and several other physicians at the emergency department of the hospital and he was directed to a book that suggested the drug zithromax might be of some use. He telephoned the mother on Monday, April 9, to advise her of the positive result, and by this time she reported the diarrhoea had cleared up.

On April 12, Dr. Lipsett received another call from the same mother advising that her five year old, who had been well until 3:00 p.m. the day before, was now experiencing abdominal pain, diarrhoea, and vomiting. She reported the child had vomited during the night and three or four times on April 12, and had experienced diarrhoea at least six times the day before and five times so far on this date. Dr. Lipsett saw the child at the emergency department of the hospital at approximately 5:15 p.m. Based on test results with respect to the child's sister, Dr. Lipsett diagnosed cryptosporidiosis diarrhoea and advised the mother that supportive treatment only was available and that it should settle within one week. The mother called back at 8:00 p.m. that night and asked if Dr. Lipsett could prescribe something for the child who was having "a lot of cramps and diarrhoea." In one of the discussions with the mother on April 12, she mentioned to Dr. Lipsett that she had been questioned by a public health inspector with respect to the first child's diagnosis.

At this point Dr. Lipsett phoned the pharmacist at the Wal-Mart pharmacy to ask about her knowledge of the drug, zithromax, which was supposed to attack the parasite though not provide immediate relief for the diarrhoea, and also discussed with her several anti-diarreal medications. During this conversation the pharmacist offered the chance remark that she could not keep the shelves stocked with anti-diarreal medication. Following this call Dr. Lipsett telephoned Dr. Benadé.

Dr. Lipsett advised Dr. Benadé that he had one confirmed case of cryptosporidiosis and that another child in the family was sick with the same symptoms. He told him of his discussion with the pharmacist that anti-diarreal medication was in high demand, and he went on to say as a result, "probably it was part of a bigger problem." Dr. Benadé agreed that Dr. Lipsett associated his patients with the large amount of anti-diarreal medication sales. Dr. Benadé said he was not that surprised that two members of the same household would fall ill with the same illness because it was transmittable through person-to-person contact. Dr. Benadé proceeded to question Dr. Lipsett about possible sources of the illness along the lines of the enteric disease questionnaire. Dr. Lipsett did not know at this time but subsequently found out that these children were babysat by their grandparents in North Battleford on a regular basis. Dr. Benadé did not ask him to further question the mother. Dr. Lipsett did tell Dr. Benadé that he had not noticed any significant increase in gastrointestinal illness in his own medical practice in the recent past.

On Good Friday morning, April 13, 2001, Dr. Benadé went to his office and checked the communicable disease log to see what had been reported on cryptosporidiosis. He became aware of the two cases referred to above, which he stated did not appear to have much in common. The first case was a child who lived on a farm 13 kilometres from North Battleford. The second case, Dr. Lipsett's patient who had been investigated by Mr. Startup, lived in the Town of Battleford.

Dr. Benadé stated that his office had tracked cryptosporidiosis in North Battleford since 1995. He had become the medical health officer for the Battlefords Health District in August of 1996. He stated he had not been briefed on the possible outbreak of cryptosporidiosis that had occurred in North Battleford in 1994, referred to earlier herein. He had never been briefed by anyone on the fact the North Saskatchewan River has relatively high concentrations of *Cryptosporidium parvum*, especially in the spring of the year and following high precipitation events, nor had he been briefed on how difficult it is to treat water that contains *Cryptosporidium parvum*. Within the office, Mr. Koroluk and Mr. Startup had been employed at the time of the 1994 *Cryptosporidium parvum* investigation, and Mr. Startup had been involved in taking samples of raw water from the North Saskatchewan River and from the surface treatment plant in North Battleford at the request of the provincial laboratory.

Dr. Benadé indicated he was aware that, as an enteric disease, cryptosporidiosis is under-reported because the only way it can be identified is through a stool sample, and it is usually only in seriously ill cases that a stool sample is requested. He indicated the vast majority of cases are mild to moderate, and self-limiting in the sense that the diarrhoea will run its course within 4-7 days. He pointed out that most enteric disease is caused by viral pathogens which are much more prevalent. He pointed out that whether a stool sample is ordered in any one case is at the discretion of the physician, but there has been a trend in recent times, particularly by the large hospital laboratories in the larger cities, as part of cost-cutting, to inform physicians to only submit stool samples when they consider it reasonably necessary to do so. This was confirmed by Dr. Gregory Horsman, director of the provincial laboratory. Dr. Horsman testified there had been a definite decline in the number of stool samples being submitted to the provincial laboratory, and this was a source of concern to him and in his view was limiting the ability to track disease in the province.

Dr. Benadé, on April 13, did some extrapolating on the normal background rate of gastroenteric disease for the Battlefords Health District and concluded it would be approximately ten cases per day, not all of which would be reported to a physician.

Dr. Benadé checked at the emergency department at the Battlefords Union Hospital and learned that 83 cases had been seen in emergency on April 13, only five of which reported diarrhoea. Anecdotal evidence from nurses at the hospital told him they had not seen an increase in diarrhoea-related cases.

At this point it should be noted that the epidemiological study performed by Health Canada shows that the peak of the outbreak was in fact April 13, 2001, as will be reviewed more thoroughly hereinafter.

On the weekend of April 14 and 15, 2001, Dr. Benadé worked shifts at the Battlefords Union Hospital, which he stated he does from time to time in order to maintain his skills as a general practitioner. On the first of these two days there were eight cases of diarrhoea in emergency out of 103 patients, and on April 15, 2001, there were nine cases out of 84 patients. None of these cases were what he described as severe. He nevertheless did order stool samples on those patients that he did see who had diarrhoea.

Dr. Benadé indicated that he telephoned other pharmacies in Battleford on April 14, 2001, and confirmed what Dr. Lipsett had been told that there was indeed an increase in sales of anti-diarreals. He also questioned patients, both who did and did not have diarrhoea, about their knowledge of diarrhoea in the community.

On April 15, 2001, Dr. Benadé ordered the hospital staff to look back at emergency visits at the hospital related to enteric disease for the month of April. Because the physicians were still reporting to him that they had not seen an increase in diarrhoea, he wondered if they had simply caught the tail end of something. His perception was that there was an increase in diarrhoea, but no evidence to suggest an outbreak, or any particular source.

April 16 was a holiday for the community health staff. At approximately 9:00 a.m. on April 17, Dr. Benadé reported to Mr. Koroluk and Mr. Startup the gist of his conversations with Dr. Lipsett on April 12. Mr. Startup testified:

> A He [Dr. Benadé] also noted that his family had experienced diarrhoea, and another person in our office he – her family had experienced diarrhoea and another local physician, who lives in the same area, had experienced diarrhoea.
>
> Q In terms of same area, what do you mean same area?
>
> A We all live in the Town of Battleford, at the north end.
>
> Q Okay.
>
> A And my wife also experienced diarrhoea the week before that.

At this point Dr. Benadé asked Mr. Startup to check with the Town of Battleford water treatment plant to see how it was operating, and determine if there had been any malfunctions. Dr. Benadé also requested Mr. Startup go back to the emergency room and reinforce Dr. Benadé's instructions of April 15 that they should track all diarrhoea cases from the beginning of April up to the present.

Mr. Startup reported to Dr. Benadé later that day in a memorandum stating that in checking with the water treatment plant operator for the Town of Battleford, which is a ground water system treated with filtration and chlorination, he had been advised that there had been no positive bacteriological samples recently, and a review of the chlorine records indicated that the regulations were being met throughout the months of March and April both for free chlorine and total chlorine. In this memorandum Mr. Startup indicated he had confirmed that Battlefords Union Hospital was tracking the cases in emergency from April 1, 2001, and ascertaining in each case whether or not a stool sample had been taken.

Also on April 17, 2001, a third finding of *Cryptosporidium parvum* was reported by the provincial laboratory to the health district. This patient also lived in Battleford. Mr. Startup conducted his investigation the same day. In his memorandum to Dr. Benadé of April 17, 2001, Mr. Startup advised Dr. Benadé that the two cases he had investigated in the past week both resided in Battleford and further that both parents had reported many cases of diarrhoea illness in St. Vital's School and John Paul II School. The third patient's mother reported that she had experienced symptoms one week previously and many of her relatives had also exhibited similar symptoms. None had gone to a physician. John Paul II School is located in North Battleford as opposed to Battleford, and Mr. Startup learned that the 15-year-old patient went to school there. He did not put this in the memorandum to Dr. Benadé. He concluded the memorandum: "these two cases have nothing in common except that both live in Battleford."

On Wednesday, April 18, Mr. Startup travelled to Meadow Lake in connection with his work but not on *Cryptosporidium parvum*-related matters. On Thursday and Friday of the week Mr. Startup became ill. He did not return to work until April 23. Mr. Piatt, the other health inspector in the office, was on vacation all of this week and out of the province. When he returned he attended a course in Saskatoon on April 23 and 24.

Dr. Benadé was cross-examined as to whether he was aware that John Paul II School was in North Battleford and he replied he was. He was then asked why he did not consider phoning someone from that school to ascertain if there had been any other cases of gastroenteritis at the school. He replied, "because it was the Easter break there was nobody to phone."

On April 19, 2001, the report from Battlefords Union Hospital indicated 113 cases of patients with diarrhoea had been recorded since April 1, 2001, only five of whom had stool samples taken. Dr. Benadé indicated this was higher than he had been expecting, but given the background number of ten per day, it was not altogether out of line. On this date a fourth case of *Cryptosporidium parvum* was reported by the lab with respect to a patient who resided in Turtleford, Saskatchewan, a community approximately 80 kilometres from North Battleford. Dr. Benadé indicated this simply added more confusion to the analysis. There were still no cases from North Battleford proper.

On April 20, 2001, Dr. Benadé did a spread sheet to see what he could learn the four cases so far had in common. He stated there was nothing conclusive. In his mind he thought the outbreak, if there was one, still looked viral. Dr. Benadé indicated that without a source for the *Cryptosporidium parvum* being identified, it was not appropriate to issue a boil water order.

There was no particular activity or reports over the weekend of April 21 and 22, 2001. On the weekend of April 14 and 15, Dr. Benadé had requested physicians to submit stool samples from patients experiencing diarrhoea and he himself had done so. It usually takes a day or two for a patient to return with a stool sample. Thereafter, it takes 5-7 days to turn around stool sample results. On April 23, Dr. Benadé phoned Dr. Horsman in charge of the provincial laboratory and ended up speaking to a lab technologist to determine what, if any, results the lab had from any samples submitted. The lab technologist indicated there would be some results forthcoming later that day. In the afternoon Dr. Benadé spoke with Dr. Horsman who indicated that several tests were coming up positive for *Cryptosporidium parvum* and he would provide the details later that afternoon. At 4:09 p.m. Dr. Horsman e-mailed Dr. Benadé indicating the provincial laboratory had processed nine positive *Cryptosporidium parvum* tests in the month of April; one from Swift Current and the other eight from the North Battleford area. Of the four new cases reported, three patients resided in North Battleford, and one in the Town of Battleford. Dr. Benadé tried to contact Mr. Meekma, the local SERM official but, as noted above, he was on vacation. He tried to contact the city people he would normally deal with but could not reach them. Dr. Benadé indicated at this point he realized that North Battleford could be a common factor, and that the source of the *Cryptosporidium parvum* could be water-borne.

After receiving the foregoing information Dr. Benadé testified he still was not certain what was happening. He stated:

> So up to this point it just wasn't clear because these cases were scattered, two in the Town of Battleford, one on a farm, one in, you know, another community outside. Now all of a sudden we had cases in the City of North Battleford and I think there was one in the Town.
>
> So the question now is, again, in terms of source, what could potential possible sources be, did all of these individuals contract it in Turtleford, were they all on the farm, were they all – did they all contract it in the Town of Battleford or is there something totally unrelated, a public function that, for whatever reason, we've missed so far which they were all present at, did they all swim in the same pool, you know, just by chance or design.

> So these, you know, kinds of things just open up new possibilities and, of course, you know, one of the options would be that, by some weird incidence, they were all exposed in the City of North Battleford, but, you know, the initial cases did not present in the City of North Battleford and this was now the lead pointing in that direction.
>
> Chronologically, it doesn't make sense, if you look at it that way, but it's a possibility that you need to consider. So the next step would be to look at the possibility – you know, one of the possibilities of public water supply exposure in the City of North Battleford.

On the evening of April 23, or early morning April 24, 2001, Dr. Benadé prepared a memorandum headed up "urgent" to all physicians and health care facilities in the Battlefords Health District advising of a possible *Cryptosporidium parvum* outbreak. His letter stated in part:

> Subsequent to the notification of a case of Cryptosporidiosis a week ago, the following alarming facts have been discovered upon closer investigation:
>
> - 113 cases of diarrhoea/gastroenteritis/enteritis have been seen in the Battlefords Union Hospital emergency room in the month of April alone.
> - Of the above, only 5 cases had stool samples submitted for examination.
> - Of the 5 lab samples, 4 tested positive for *Cryptosporidium parvum.*
>
> With the limited information available at this time we cannot exclude the possibility of a *Cryptosporidium parvum* outbreak. ... From a public health perspective, we have to consider the possibility of person-to-person, food-, or water-borne transmission. Attached is a data sheet with key facts.

(The data sheet was from the Centres for Disease Control and Prevention in Atlanta, Georgia on "*Cryptosporidium parvum.*") A copy of this letter was forwarded to Dr. Eric Young, deputy public health officer for the Province of Saskatchewan in Regina.

Also on April 24, 2001, Dr. Benadé met with Mr. Startup and asked him to contact officials at the City of North Battleford to determine if they had experienced any problems with their water treatment facilities. Mr. Startup contacted Mr. Strelioff at 10:00 a.m. After updating him on what had been developing, he asked him if he was aware of any problems with the water treatment plants serving the City of North Battleford. Mr. Strelioff stated he was not aware of any, but he did report that they were having problems forming a proper floc blanket at the surface water treatment plant because of low river turbidities. Mr. Startup was not aware of the significance of the floc blanket and did not make a connection between this fact and the cryptosporidiosis cases at the time. Obviously, neither did Mr. Strelioff. Mr. Startup verbally reported to Dr. Benadé that Mr. Strelioff had assured him there were no problems at the water plant.

After obtaining the foregoing information, Mr. Startup left the office for Lloydminster where he was following up on an *E. coli* case. From Lloydminster he had a telephone conversation with the provincial epidemiologist, Helen Bangura, and in passing mentioned to her the cryptosporidiosis investigation that was being conducted in North Battleford. Ms. Bangura e-mailed Dr. Young with Mr. Startup's information.

On his way back from Lloydminster Mr. Startup interviewed the mother of the patient from Turtleford who was the fourth confirmed case of cryptosporidiosis. In this interview Mr. Startup learned that three other members of the same family had been ill with diarrhoea symptoms. He learned they had recently travelled to Saskatoon from Turtleford. He did not at the time ask if they had stopped in North Battleford on their way to Saskatoon or on their way back. Subsequent investigation disclosed that the family had been in North Battleford several times in the recent past, including attendance at a hockey tournament.

At 4:00 p.m. on April 24, 2001, two additional positive tests for *Cryptosporidium parvum* were reported by the provincial laboratory on persons who resided in North Battleford. This brought the total number of confirmed cases to ten.

At approximately 3:00 p.m. on April 24, 2001, Dr. Young, who had been in meetings up until then, reviewed the e-mail he had received from Ms. Bangura and the fax that Dr. Benadé had forwarded to physicians in the Battlefords area. He took the information to Dr. David Butler-Jones, who is the public health officer for the province, and they discussed the information that was available. They concluded that it would be necessary to get a meeting of the various stakeholders together to review information and discuss the situation. One of them telephoned Dr. Benadé to request that he put a meeting together for 7:00 p.m. that evening with officials from the Town of Battleford, the City of North Battleford, the Battlefords Health District, and SERM, and that Dr. Butler-Jones would attend the meeting by telephone from Regina. At approximately 5:30 p.m., Dr. Benadé called Mr. Startup at home and requested that he have the mayor of the Town of Battleford and the water treatment manager for the Town of Battleford attend the meeting that evening, and that he and Mr. Koroluk should also attend.

Earlier on, at approximately 4:30 p.m., Mr. Startup decided, in the absence of Mr. Meekma on holidays, he would attempt to alert SERM officials in Saskatoon. There was a contact list attached to the interim protocol on bacteriological follow up referred to earlier, which contained the names and numbers of SERM officials. He ended up speaking with Mr. Dale Bonke and Mr. Mark Getzlaf, manager for environmental protection in the Parkland EcoRegion which includes the Battlefords. He updated them on the cryptosporidiosis cases confirmed, and indicated to them the possibility that a water source could be the problem. Mr. Startup passed on to them the information he had received from Mr. Strelioff with respect to the problem of forming a floc blanket in the solids contact unit at the surface water treatment plant. One or more of these SERM individuals stated they would immediately contact the City of Saskatoon water treatment lab and try and arrange to have a person attend in North Battleford that evening to do testing for *Cryptosporidium parvum* in the water supplies. This in fact occurred and will be touched on later.

The meeting did take place at 7:00 p.m. Included were the persons from Battleford, and Dr. Benadé, Mr. Koroluk, Mr. Startup, and Mr. John Yarske, CEO of the Battlefords Health District, as well as Mr. Piatt who had now returned from holiday. The city was represented by the Mayor and Mr. Strelioff.

Dr. Butler-Jones testified that he had arrived at the opinion that the drinking water was a strong possibility for this particular outbreak prior to attending the meeting by telephone. He stated he was aware the city had had chlorine residual problems the previous September, which raised his index of suspicion with respect to that source. He had been apprised of what the public health inspectors had learned in their investigations of the earlier cryptosporidiosis cases and was aware that there was no obvious common factor that would suggest a food source. As well, they had nothing in common to suggest person-to-person contact.

At the meeting, after reviewing the information available, Mr. Strelioff was asked if there was any problem with the water treatment facilities in the city. The inability to form a floc blanket was again mentioned by him but otherwise he stated as far as he was concerned there were no problems. Mr. Strelioff did not check with any of the operators before attending this meeting and had not inquired from them their view of how the facility was working at any time up until this meeting. He stated he assumed the operators would bring to his attention any problems, and this had not occurred. No one at the meeting had the expertise to appreciate the significance of the inability to form a floc blanket in the solids contact unit. Dr. Butler-Jones and Dr. Benadé were inclined to issue a precautionary drinking water advisory (PDWA) even though there was no hard evidence that the drinking water in North Battleford was the source of the problem at the time. This was resisted by the Mayor who was reluctant to do so in the absence of firmer evidence because of the disruption anticipated from such an advisory based on the experience in September, 2000. The meeting adjourned to the following morning at which time it was expected a SERM representative would be present.

At 8:00 a.m. on April 25, 2001, the meeting resumed with a number of additional people present. Mr. Meekma had been telephoned at home the night before by a SERM person and asked to attend the meeting, although he was still on holiday. Again, the major topic was whether a PDWA should be issued. The City of Saskatoon had in fact conducted some tests for *Cryptosporidium parvum* the night before, but the results were not yet known. At this meeting Mr. Meekma raised the valid point as to why this investigation had been going on for two weeks and SERM had not been notified. Mr. Strelioff also took the position that he was not aware of the problem until the day before. Mr. Meekma advised the meeting that he would have issued a PDWA as soon as he learned there was no floc blanket forming in the solids contact unit. Although the source of the *Cryptosporidium parvum* had not yet been identified, it was decided that a PDWA should be issued, with both SERM and Health insisting on the same.

At 1:00 p.m. on April 25, 2001, the PDWA was issued with the appropriate press coverage and follow up. The advisory made reference to the number of positive tests for *Cryptosporidium parvum*, pointed out the source of the parasite was not known at the time, and went on to say "as a precautionary measure, all water used for human consumption should be heated until it reaches a rolling boil for three minutes, then store water in a sanitized container until used." It went on to specify as well that any water that would enter a person's mouth should also be boiled.

The City of Saskatoon laboratory was not successful in its attempts to positively identify *Cryptosporidium parvum* in the samples collected from the water treatment plants in North Battleford over the evening of April 24/25. These samples were eventually forwarded on to Hyperion Research Ltd. in Medicine Hat, Alberta for testing.

On the afternoon of April 26, Mr. Strelioff requested an engineering technologist, Ms. Judy Szuch, to compile a record of turbidities for both raw water and finished water at the surface treatment water plant for the previous several years. Mr. Strelioff indicated that he had requested this work based on information he had obtained in attending the meetings over the previous two days. Ms. Szuch was engaged in this activity when she received a call from Mr. Peter Allen, who was on his day off. She explained to him the historical work she was doing with respect to turbidities. Mr. Allen advised her to not look at the turbidities, but to look at the settling rate.

The operators had known from March 20, 2001, following a cleaning out of the solids contact unit in the surface water treatment plant that zero settling was being achieved. Mr. Strelioff was advised little or no settling was being achieved on April 9, 2001, when he was requested to requisition some bentonite to solve the problem. Mr. Strelioff did not appreciate the significance of the lack of settling in the solids contact unit and Mr. Allen, who had contacted him, did not specifically raise any safety concern about the final treated water product. Mr. Strelioff stated he had heard nothing further after requisitioning the bentonite and he therefore assumed the problem had been solved and thought nothing more of it. When advised by Mr. Allen it was the lack of settling that was the problem, Mr. Strelioff said to him words to the effect "you can't be certain of that." Mr. Allen replied he was 99% certain.

The information requested by Mr. Strelioff was compiled and given to him that afternoon. At that point Mr. Strelioff took the information to Mr. Toye, the city commissioner, and explained to him that based on what he had learned at the meetings and what he had learned from the operator: "it could be that water is the problem." The same afternoon the compiled record was given to Mr. Meekma who faxed the material off to SERM's technical people in Regina. Mr. Strelioff testified that he became aware for the first time of the possibility that the lack of settling could have allowed *Cryptosporidium parvum* parasites to proceed through the surface water plant when the same was identified for him by the operator.

Later on the evening of April 26, a telephone conference meeting took place between the parties who had been involved in the previous meeting with the additions of Mr. Joseph Muldoon, director for SERM of the Parklands EcoRegion, Mr. Getzlaf, the manager of the enforcement protection branch for the Parklands EcoRegion, and Mr. Phommavong, senior standards analyst and engineer with SERM, located in Regina. These SERM personnel were well aware of the potential problems associated with lack of settling in the solids contact unit. By this time SERM and Health persons involved in the call were persuaded the surface water treatment plant was likely the problem. It was decided the PDWA should be upgraded to a boil water order. The meeting adjourned to allow for the preparation of a boil water order, a media release, and standard questions and answers that should be publicized with respect to the order. The boil water order was issued by Dr. Benadé as the medical health officer at approximately 11:00 p.m. on April 26, 2001.

2. Physical Cause of the *Cryptosporidium parvum* Outbreak

(a) The Solids Contact Unit

On March 20, 2001, the solids contact unit in the surface water treatment plant was drained for the purpose of cleaning and repair. One of the matters to be checked was a crack in the cement floor of the unit observed the previous year. This was to be investigated and repaired if necessary. For this reason the unit was completely drained, and all sludge was removed. In years prior to 2001, a certain amount of sludge was left in the bottom of the unit to assist the settling process upon startup. On this occasion no sludge was left in the unit.

The work crew for the day was organized by Mr. Strelioff. Neither he nor the operators could remember why the work was organized for this day as opposed to some date earlier in the year. In previous years it had been done at an earlier time to avoid the possibility of unfavourable raw water conditions due to spring breakup and runoff. It will be noted this work was taking place well beyond the February 15 deadline for such work that Dr. Stanley indicated is the policy of EPCOR in Edmonton.

The draining of the solids contact unit was an annual event. The operators indicated it was expected, due to the lack of slurry, that there would be some period of time before proper settling was achieved in the unit. They stated it was for this reason the annual cleaning took place in the winter months when river turbidities were low. It was recognized that low raw water turbidity would make it easier for the filters to achieve an acceptable treated water turbidity, but it was also recognized that low turbidities made it more difficult to reestablish a floc blanket.

None of the operators foresaw a safety problem with operating the plant with little or no settling, although they did not anticipate how long the lack of settling would last on this occasion. Mr. Frank Hollman stated he was not concerned about *Giardia lamblia* or *Cryptosporidium parvum* because he did not think they would be present in the raw water when turbidities in the river were so low.

The cleaning and repair to the unit was complete by 4:00 p.m. on March 20. The solids contact unit was then filled with water after adding increased dosages of chemicals. An assistant operator was then left in charge with the instructions that he should run the water to waste until launder turbidities were less than 5 NTU and the chlorine residual was showing at least 2.0 free chlorine. Mr. Allen, who provided these instructions, testified:

> I mentioned that the minimum launder turbidity would be 5, assuming that if he made 5 that the filters would be able to polish it, finish it, clean it better than that.

The plant records indicate that water was run to waste until 7:27 p.m., a period of three and one-half hours, and thereafter water was pumped to the clearwell until 10:23 p.m. The plant records also show that the launder turbidity during the period water was being pumped to the clearwell was at 2.29, and free chlorine at 2.15.

The operators immediately discovered they were achieving no settling in the solids contact unit despite experimenting with different chemical dosages. One operator testified that, because of the amount of chemical in the water, the launder turbidities were at times higher than the raw water turbidity. In consequence, the filters required backwashing more often than usual. As noted earlier, water was not run to waste after backwashing. Mr. Strelioff was advised on at least two occasions of the lack of settling in the SCU. On or about April 9, pursuant to Mr. Allen's request, Mr. Strelioff authorized the purchase of bentonite to add to the unit in an attempt to improve the formation of floc.

The records indicate the surface water plant operated 6-8 hours per day for every day but one in the period between March 21 and April 25, 2001. The following summary reflects the final turbidities and settling rates achieved during this period of time. The turbidity recording is the last one entered for each day. As noted earlier, the following turbidity readings are a combined reading for both filter banks, leaving open the possibility that one filter was performing better than the other.

Fig. 12
CITY OF NORTH BATTLEFORD
WATER TREATMENT PLANT NUMBER 2

Date	Raw Turbidity	Final Turbidity	Free Cl2	Total Cl2	% Settling	Notes
21-Mar-01	3.39	0.211	1.2		0.1	
22-Mar-01	3.78	0.205	1.53		0.1	
23-Mar-01	3.58	0.187	1.54		0.1	
24-Mar-01	3.56	0.166	1.23		0.1	
25-Mar-01	3	0.157	0.76		0.1	
26-Mar-01	2.5	0.16	1.57		0.1	
27-Mar-01	4.01	0.41	1.87		0.1	
28-Mar-01	3.29	0.383	1.49		0.1	
29-Mar-01	2.67	0.354	1.68		0.1	
30-Mar-01	2.41	0.598	1.05		0.1	
1-Apr-01	3.14	0.554	1.61		0.1	
2-Apr-01	3.54	0.959	1.3		0	
3-Apr-01	3.87	0.731	1.05		0	
4-Apr-01	3.48	0.547	1.21		0	
5-Apr-01	2.96	0.496	1.25		0	
6-Apr-01	3.49	0.444	1.36		0	
7-Apr-01	3.86	0.424	1.24		0	
8-Apr-01	4.83	0.434	1.41		0	
9-Apr-01	5.22	0.657	1.04		0	
10-Apr-01	5.59	0.534	1.25		0.1	
11-Apr-01	5.56	0.311	1.1		0	
12-Apr-01	6.47	0.4	1.28		0	
13-Apr-01	16	0.442	1.24		0	
14-Apr-01	5.9	0.442	1.59		0	
15-Apr-01	6.93	0.379	1.42		0	
16-Apr-01	6.65	0.405	1.19		0	
17-Apr-01	7.05	0.33	0.98		0	
18-Apr-01	15	0.382	0.98		1	
19-Apr-01	21.1	0.509	1.2		1	
20-Apr-01	30	0.228	1.27		2	
21-Apr-01	18.4	0.185	1.22		2	
23-Apr-01	12.6	0.389	1.42		3	
24-Apr-01	16.1	0.44	1.23		6	
25-Apr-01	15.4	0.578	1.72		8	

Source: City of North Battleford
Exhibit C-13 Tab 15

It will be observed that almost no settling occurred in the unit until April 24, 2001, when 6% was achieved. It will also be observed that treated water turbidities were over 0.5 for nine of the days, and over 0.3 for an additional 13 days. It will be recalled that 0.3 NTU is considered the maximum turbidity to safely operate a conventional surface water plant when there is a risk of *Giardia lamblia* or *Cryptosporidium parvum* being in the raw water. This standard assumes a normal settling rate which was absent here. It is concluded from the foregoing that if *Cryptosporidium parvum* was in the raw water entering the plant, the plant was operating sufficiently sub-optimally to allow *Cryptosporidium parvum* oocysts to escape the processes and find their way into the treated water. This is particularly true given the breakthroughs that can occur when the filters are placed back on-line following backwashing without having been ripened by running water to waste for a period of time. (One operator stated he did observe some spikes in turbidity after putting the filters back on-line.) Subsequent testing for *Cryptosporidium parvum* proved this to be the case.

(b) *Cryptosporidium parvum* Testing

On the night of April 24/25, 2001, City of Saskatoon water treatment laboratory personnel attended at the surface water treatment plant at the request of SERM. Eight samples were taken from taps at various locations in the plant. The plant has an internal plumbing system. All samples taken were of finished, treated water.

Two of the eight samples produced positive results. One sample identified seven cysts, six of which were dead and one of which was viable. In the second positive sample, six cysts were located of which four were dead and two were viable. It may be recalled that testing for such oocysts results in somewhere between a 10% and 50% identification rate.

On April 26, five 10-litre samples of raw water were obtained from the area of the raw water intake at the surface water plant. Two of these samples tested positive for *Cryptosporidium parvum*. One sample identified five viable cysts which extrapolates to 50 oocysts per 100 litres of water. The other sample produced two viable cysts and one dead cyst which extrapolates to 30 oocysts per 100 litres. It will be recalled that US EPA and the Province of Alberta require a 2.5 log removal over and above conventional treatment whenever the concentration of oocysts in raw water exceeds 7.5 per 100 litres. The North Battleford plant did not qualify for any additional log reductions based on the processes in use.

By April 28 the settling rate in the solids contact unit was back to the 12-15% range. No *Cryptosporidium parvum* testing of the water distribution system occurred until June 15, when a number of samples were obtained from different locations in the distribution system on different days through to July 11, 2001. Only one positive sample resulted from this testing and consisted of one dead oocyst found in a sample taken June 22.

c) Sewage Effluent – DNA Analysis

The conclusion reached with respect to the effect of sewage effluent from the sewage treatment plant on the raw water intake of the surface water treatment plant offered in the section on the sewage treatment plant (see page 55) was that the flow of the North Saskatchewan River does change from time to time with the result that at least sometimes this effluent passes over the raw water intake. There is no way to know if this was in fact the case in the period between March 20 and April 26, 2001. The most that can be said is that it is a strong possibility given the lengthy period of time involved.

As referred to in the section on *Cryptosporidium parvum*, (see page 14) there are two genotypes of the parasite; human and animal. In May, 2001, the provincial laboratory forwarded to the University of British Columbia affiliated laboratories at the British Columbia Centre For Disease Control, 49 fecal specimens from 45 patients who had tested positive for *Cryptosporidium parvum*. From this group of specimens, 12 fecal specimens were selected randomly covering a specimen collection period from May 2 to May 14, 2001. *Cryptosporidium parvum* genotype 1 (human genotype) was confirmed in 11 of the 12 patient fecal specimens that were tested. One patient's specimen could not be genotyped.

The City of Lloydminster does not discharge sewage effluent into the North Saskatchewan River. Edmonton does, but after it has been through tertiary treatment. What the situation is between Lloydminster and Edmonton is not known.

The inquiry did not receive expert evidence on the significance of 11 out of 12 random samples being of the human genotype, or whether this was possible without effluent from the North Battleford sewage treatment plant finding its way to the raw water intake of the surface water plant.

(d) Epidemiological Study

An epidemiological team from Health Canada's field epidemiology training program was requested by the provincial Department of Health to investigate the outbreak of gastroenteritis in North Battleford on April 25, 2001. The first field person, Dr. Robert Sterling, arrived in North Battleford on April 26, and the second person, Dr. Jeffrey Aramini, arrived on April 29. Both of these persons are trained epidemiologists, and worked under the direction of Dr. Andrea Ellis, section head and senior epidemiologist in the outbreak response and issues management section of the division of enteric, food-borne and water-borne diseases section of Health Canada.

The team, with the assistance of personnel from Saskatchewan Health and the Battlefords Health District, carried out a number of investigations commencing April 26:

(a) data analysis which included identifying those persons affected by gastroenteritis through multiple avenues such as emergency department records, physician records, requests to report, etc., and the geographic distribution of all such cases;

(b) performed a cross-sectional study to estimate the number of persons with gastroenteritis in the Battlefords area over and above what normally would be expected in the background rate;

(c) conducted an anti-diarreal drug sales review of three pharmacies in North Battleford; and

(d) did an environmental study analysis based on information received about the surface water treatment plant including records of turbidity readings and settling rates for the year 2001.

The only material issue taken with the study by the City of North Battleford was that of the persons reporting gastroenteric disease, 119 people reported a diarrhoea onset prior to March 21, 2001. Ten of these persons were confirmed to have *Cryptosporidium parvum* oocysts in their stool specimens. The study excluded all 119 of these persons.

The study team defined a primary case for the purposes of the study as a person who reported the onset of diarrhoea from March 21, or later, and who had not experienced diarrhoea in the household in the period between February 14 and March 20. A secondary case was one who met the primary definition but whose symptoms did not appear until at least seven days after the primary case.

It was suggested by the city that the ten cases with onset of symptoms prior to March 21 demonstrated the presence of *Cryptosporidium parvum* in the city prior to the solids contact unit being repaired on March 20. Dr. Ellis testified there were three possibilities with respect to persons reporting onset of symptoms prior to March 20:

(a) the person had experienced gastroenteritis and subsequently became infected with cryptosporidiosis;

(b) the person was in error on the onset date of the symptoms; or

(c) the person did ingest *Cryptosporidium parvum* before March 20.

Dr. Ellis testified that based on the results of the study she found one of the first two possibilities much more likely than the third.

With respect to the foregoing possibilities, it is important to note that no cryptosporidiosis confirmed cases were confirmed prior to March 20. As will be recalled from the investigation section [see page 131], only four cases had been confirmed by April 19, 2001. Dr. Lipsett's patient, who visited him on March 21 and March 26, is the only one of these four persons who possibly had an onset of symptoms prior to March 20. The evidence establishes that the turnaround time with respect to obtaining a stool sample is approximately seven days from collection to reporting by the laboratory. Therefore the ten confirmed cases from the 119 who reported earlier onset symptoms did not have their stool samples collected prior to April 15, 2001, because the earliest these cases could have been reported was April 23. After April 19, four confirmed cases were reported on April 23, and an increasing number after that.

Dr. Lipsett's patient first visited him on March 21, to have her ears checked and with symptoms of a cold. The mother reported the child had pain in her abdomen at the time, but did not report diarrhoea. On March 26, 2001, the mother and child returned to Dr. Lipsett when she reported the child had been experiencing diarrhoea for the past six days. If this information is correct, the diarrhoea began on March 20, and yet was not mentioned on the visit of March 21. Dr. Belosevic testified the latent period for cryptosporidiosis is five to ten days. This child's stool sample was collected on March 27, 2001, seven days after March 20, 2001. By March 30, 2001, the child's mother reported to Dr. Lipsett that the diarrhoea had settled. Dr. Benadé testified that diarrhoea, in cases of cryptosporidiosis, will run its course in four to seven days. Thus, between March 20 and March 30, there is time for a five day latent period of the *Cryptosporidium parvum*, and a five day diarrhoea period, both of which periods fall within normal ranges.

That the child was infected with *Cryptosporidium parvum* prior to March 20, 2001, remains a possibility. That Dr. Lipsett misinterpreted the mother's remarks that the child had experienced diarrhoea for the previous six days also remains a possibility, bearing in mind the mother did not report diarrhoea when she attended Dr. Lipsett on March 21, 2001. The child was ill prior to March 20, 2001, and it is simply not known when she became infected with *Cryptosporidium parvum*. I accept Dr. Ellis's opinion that, based on the cumulative evidence, it is more likely than not that the child became infected after March 20, 2001. It is concluded there was no evidence of cases of cryptosporidiosis in the North Battleford community prior to March 20, 2001.

The study concluded an estimated 6,850 persons in the North Battleford and Battlefords area following March 20, 2001, experienced gastroenteritis over and above the background rate that would be expected. The study also identified 868 persons from communities elsewhere in Saskatchewan, and Alberta and Manitoba, who experienced gastroenteritis during this same period, but no attempt was made to extrapolate this identified number into a total number who might have been so affected.

The study concludes the first primary case occurred in the Battlefords area on March 21, 2001, and the peak in primary cases occurred on April 13, the beginning of the Easter holiday long weekend. The peak for secondary cases occurred on April 15, 2001. (See Figure 13)

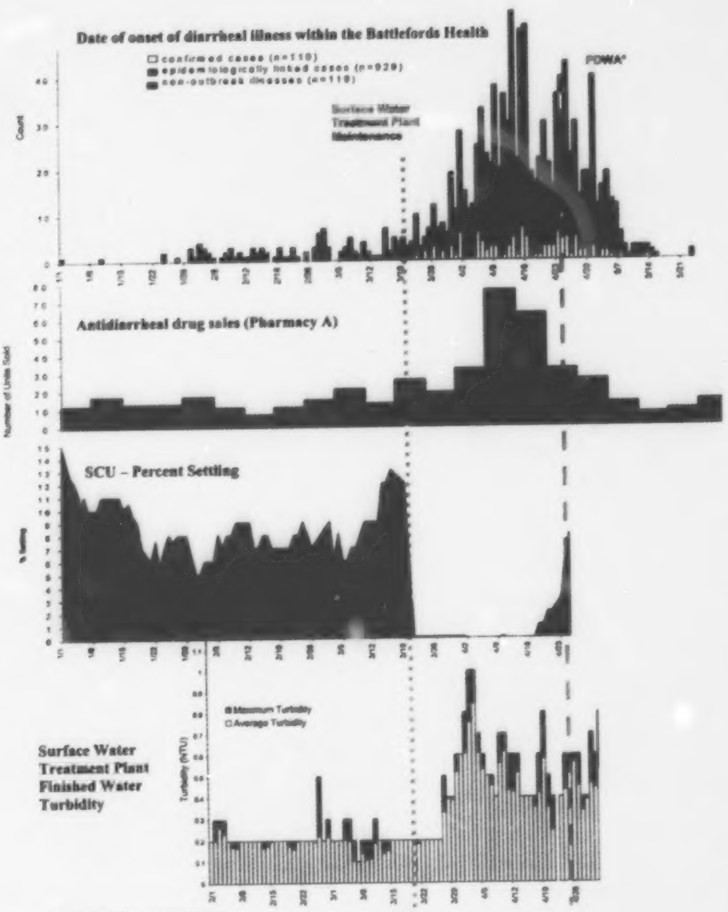
Anti-diarreal drug sales were reviewed for the 2001 year from three different pharmacies. During the period of the outbreak all three pharmacies experienced an approximate five-fold increase in sales of anti-diarreal medication. (See Figure 13)

As noted in the section on the water distribution system in the City of North Battleford [see page 57] the surface water treatment plant serves primarily the east side of the City of North Battleford. The study concluded that individuals residing in the southeast part of the city were 2.2-3.8 times more likely to have experienced gastroenteritis symptoms than were persons living in the northwest. The report states:

> This gradient in disease risk appeared to correspond to the estimated distribution of surface water in the city, with more surface water reportedly serving the southern and eastern areas.

The study also produced charts showing the final water turbidity and the settling rates in the solids contact unit which had been recorded in the year 2001. (See Figure 13)

Fig.13
COMPARISON OF WATER QUALITY DATA WITH DISEASE BURDEN DATA



* Precautionary Drinking Water Advisory

Source: North Battleford, Saskatchewan
Spring, 2001
Waterborne Cryptosporidiosis Outbreak
Health Canada
Exhibit C-12 Tab 2

As will be observed from Figure 13, the comparison of water quality data and the disease burden data shows a very strong correlation between the two.

(e) Laboratory Investigations

One hundred and ten (11%) of the cases in the Battlefords area were confirmed by the laboratory to have *Cryptosporidium parvum* oocysts in their stool. One hundred and sixty-five (19%) of the persons who lived away from the Battlefords area were laboratory confirmed cases. The epidemiological study states with respect to laboratory investigations as follows:

> [I]n brief, the Health Unit and the provincial health officials did not receive notification of increases in the identification of bacteria or parasites, other than *Cryptosporidium parvum*, in stool specimens submitted from persons associated with the outbreak. No viruses were detected in 12 randomly selected stool specimens submitted to the Saskatchewan provincial laboratory in early May. In addition, investigation of people with diarrhoea who travelled through North Battleford by other laboratories in Saskatchewan, Manitoba, Alberta, and British Columbia identified *Cryptosporidium parvum* as the only pathogen present.

(f) Cause

The evidence establishes that between March 20 and April 25, 2001, the surface water treatment plant in North Battleford was very vulnerable, because of the lack of settling in the solids contact unit and turbidity levels that would allow *Cryptosporidium parvum* parasites to escape the treatment process and survive in the treated water. Subsequent *Cryptosporidium parvum* testing demonstrated the presence of *Cryptosporidium parvum* oocysts in the treated water. Persons living in the area of North Battleford who received their drinking water from the surface water treatment plant were much more likely to experience gastroenteritis than persons residing in parts of the city served by the ground water treatment plant. The results of the epidemiological study reflected in Figure 13 above show a very strong correlation between the period when no settling was being achieved in the SCU and the presence of enteric illness in the community. There is no evidence of any cause of the widespread outbreak of gastroenteritis in the Battlefords area other than *Cryptosporidium parvum*. No other theories were offered at this inquiry.

The direct and circumstantial evidence leads to the conclusion very close to certainty that the enteric disease outbreak in North Battleford in April, 2001, was caused by *Cryptosporidium parvum* that entered the surface water treatment plant in the raw water from the river. The parasite thereafter escaped the treatment processes in the plant, ended up in the treated water, and from there ended up in the water distribution system in North Battleford from which people obtained their drinking water.

FINDINGS

26. The cause of the enteric disease outbreak in North Battleford in April, 2001, was the presence of *Cryptosporidium parvum* in the treated drinking water produced from the surface water treatment plant.

PART V - RESPONSE TO THE OUTBREAK

1. SERM-Health's Protocol for Removing the Boil Water Order and the City of North Battleford's Response

On April 26 and 28, 2001, a SERM project manager knowledgeable in water and wastewater treatment facilities and Mr. Meekma inspected the surface water and the ground water treatment plants. On April 30, they inspected the sewage treatment plant. On May 4, a report on these inspections was forwarded to the mayor and council of the city. The covering letter stated in part:

> The recommendations contained in the reports are preliminary in nature, based on the best information currently in SERM's possession. SERM is providing the reports to the City at this time as SERM is aware that the City desires to take immediate steps to address the situation. However, SERM anticipates that the City's engineering consultant will perform a more comprehensive review of all of the relevant systems. As further facts are uncovered, more steps that are not identified in these preliminary reports may be required in the future.

In the course of conversation with Mr. Strelioff during the inspections it was made known that one of the recommendations would be that the city engage the services of an engineering consultant to assess the adequacy of the drinking water treatment facilities. On April 29, 2001, Mr. Strelioff engaged Mr. Rodger McDonald, P.Eng., of MR2 - McDonald & Associates, consulting engineers, to be the city's consultant and he has acted in this capacity since. Mr. McDonald proceeded immediately to implement changes to the surface water treatment plant and to supervise the requirements placed on the city by SERM as a condition for removal of the boil water order.

The protocol for removing the boil water order was eventually signed on June 19, 2001, by the City of North Battleford, SERM, the Battlefords Health District, and the Saskatchewan Department of Health (Appendix "C"). The protocol was a negotiated document and went through several drafts. The document was directed at six major topics:

- the production of microbiologically safe drinking water;

- that the ground water supply be confirmed not to be under the direct influence of surface water from the river;
- that the water distribution system be flushed with microbiologically safe drinking water, and that all water including that in the reservoirs be replaced with safe drinking water during the flushing process;
- procedures for the operation and maintenance of the primary water treatment components be developed and formally implemented with all operators being made aware of these new procedures;
- monitoring of the treated water over a specified period must conclusively demonstrate its microbiological safety; and
- that the water-borne disease outbreak be assessed as over by the medical health officer.

In addition, the city was required to submit a transitional management plan, acceptable to SERM, for the continued safe operation of the water works until such time as a revised minister's order was in place. This transitional management plan would also have to be acceptable to the Battlefords Health District. The protocol went on to spell out what was required to meet these objectives.

On July 17, 2001, the City of North Battleford submitted its information to SERM in support of removal of the boil water order. The submission addressed the point-by-point requirements in the protocol for removal of the order. With respect to the surface water treatment plant the submission stated:

> 1. (a) Surface Water Treatment Plant
>
> The safety of the surface water treatment plant is demonstrated by turbidity, free and total chlorine residuals, total coliform and fecal coliform levels which meet SERM's objectives/regulations for safe drinking water. The water has

> been tested for Cryptosporidium and Giardia organisms in accordance with the accepted protocol and is demonstrated to be free of Cryptosporidium and Giardia. Test results for turbidity, free and total chlorine, total and fecal coliforms and Cryptosporidium/Giardia as identified in the sampling protocol are attached.
>
> The surface water treatment plant interim operations procedures which accompany this report provide that the plant will be run to waste if filter effluent turbidities exceed 0.3 NTU. This practice has been in place since early May and is now the standard interim operating procedure.

Mr. McDonald's report stated the modifications that have been made to date to the surface water treatment plant and what future changes are proposed. The report states:

> 4. WATER TREATMENT PLANT NO. 2
>
> 4.1 Initial modifications at the water treatment plan focussed on process and measurement issues. Major early changes included:
>
> - Installation of piping to permit direct wasting of effluent of the solids contact unit.
> - Installation of valve and piping to permit filter to waste operations from Filters 3 & 4. The piping work was completed by May 8, 2001.
> - Provision of sampling sites to measure filter to waste quality.
> - Operational requirements for filter to waste procedures following backwash.
> - After a review of options, relocation of primary coagulant feed points to achieve rapid mixing (through the cyclonic sand separators).

- Provision of monitoring sites for continuous turbidimeter and particle count analyzers.
- Installation as necessary of injection points for filter aid applications.
- Provision of an in-place standby coagulant feeder.
- Installation of a new manway cover for the clearwell at Filters 3 & 4.

4.2 An interim procedures manual was prepared that addressed the process and physical systems, quality assurance and quality control, and an overview of operations. Some of the key items included:

- Capacity values.
- Emergency plant shutdown scenarios and action points.
- Water quality targets and routine monitoring.
- A revised record keeping form and records maintenance.
- Communications requirements.

4.3 A major proposed change is the provision of a supplementary treatment barrier. The selected option was ultraviolet reactors because of the beneficial application for a large number of water-borne pathogens and the feasibility for incorporation within the current plant's framework. After due consideration, a supplier was chosen. Installation of the two units, one on each of the filter bank effluents, is expected by mid-December. In conjunction with implementation of the U.V. systems, post-filter chlorine disinfection will be provided and a flow meter will be installed for one of the banks to better define filtration rates.

4.4 Installation of permanent particle counters for each filter bank effluent and continuous turbidimeters for the raw water and each filter effluent are underway.

4.5 The filters have been examined and the filter media characterized. Following an inspection of the underdrain systems, a recommendation for filter media will be made. Presently it appears the oldest media (in Filters 3 & 4) may warrant replacement.

4.6 Some testing has been carried out to assess coagulation/flocculation chemicals and dosages. Further work is anticipated. Improvements to the filter ripening period have to be achieved.

4.7 Some other measures being addressed or under consideration include:

- Modifications to the chlorination room and feed system.
- Change of the laboratory area and provision of a control room.
- Improvements for other chemical feed systems.
- Provision of baffling for increased clearwell disinfectant contact times.
- Potential for rehabilitation and modification of disused clarifier (hydrotreater) facilities for backup or pretreatment purposes.

In his testimony on November 27, 2001, Mr. McDonald stated the particle counters on the filters were being placed at the time, that turbidimeters had been installed on the filter banks, and a new raw water turbidimeter had been installed. He indicated a new computer had been purchased to allow the operators to read the turbidimeter and particle counts from a remote location in the plant. Mr. McDonald indicated the city was looking at incorporating a SCADA system (supervisory control and data acquisition system) to complement remote operations and remote interrogation of all of the other systems within the plant. He confirmed that ultraviolet reactors have been purchased and would be installed in December, 2001.

As for the water distribution system, all of the reservoirs except the water tower now possess a re-chlorination capability that was absent prior to September, 2000. As well, the manual valves have been replaced with automated valves that allow for far more movement of water from the reservoirs into the distribution system than was occurring in the past. In addition, supplementary chlorination has been added at the sewage treatment plant allowing for additional chlorination of bypass sewage. The new protocols require that the sewage treatment operator notify the surface water treatment plant operator forthwith upon any sewage bypass, at which point the surface water treatment plant is to be shut down for a period of four hours following the end of the sewage bypass.

The interim procedures manual which accompanied the request to lift the boil water order provides for emergency plant shutdowns, or the wasting of water, in the event of a sewage treatment plant bypass, any upset in the solids contact unit, loss of chlorine disinfection, or treated water turbidities of greater than 0.3 NTU. There is still no capability to waste water from the clearwells in the plant, other than external pumping out of the same.

A new form for daily manual recording of all of the required measurements has been prepared and is more user-friendly than the previous one. It is contemplated such a manual record will be maintained even if a new computer program is introduced. The protocol does not provide for how often such records should be reviewed by the manager of the water treatment facility, but the quality assurance provisions in the procedures manual make the point that both internal and external audit of such records should be part of a normal quality assurance measure. The protocol should state the frequency with which internal and external audits should occur. It is suggested, at a minimum, that all records be reviewed internally on a monthly basis, and an external audit occur at least once a year.

Arising out of the September, 2000, incident, concerns were raised on the water distribution sampling practices carried out by city personnel. In particular, there seemed to be confusion as to how long sample water should be run for the purposes of recording chlorine residuals on the form to be submitted with the bacteriological sample. There was evidence of water being left to run for up to an hour or more before recording a chlorine residual, and there was evidence of not sending in a form in which the chlorine residual was too low. Running sample water for a lengthy period of time when the system is in a remediation mode is acceptable. This purpose, however, does not seem to be differentiated from the requirements to record a chlorine residual at the same time the bacteriological sample is taken. Mr. McDonald confirmed there is a new protocol in place that emphasizes the difference between sampling for bacteriological purposes and sampling for remediation purposes. The new procedure requires that the bacteriological sample be taken after running the water for two to five minutes at which time whatever chlorine residual is recorded should be written on the bacteriological submission form. Both Dr. Stanley and Mr. McDonald confirm the new procedure accords with proper practice.

The city forwarded its information package for removal of the boil water protocol to SERM on July 17, 2001. Prior to this, Mr. Getzlaf, manager of the enforcement protection branch of the Parkland EcoRegion, and several other SERM managers, had a telephone conference call with Mr. Toye and Mr. Strelioff as to what SERM's requirement would be for removal of the order. Mr. Getzlaf followed up this conference call with a letter to Mr. Strelioff dated July 12, 2001. The letter stated in part:

> We require Council to address the City's intentions regarding monitoring compliance and the items related to turbidity at the water treatment facilities as part of the transitional management plan.
>
> ...
>
> If the City is unable to put a manager in place immediately and all other areas of concern are addressed in the protocol, as discussed, the City would provide an alternative proposal for SERM's review. This proposal must include the provision of full time, on site supervision of a qualified replacement/acting manager to ensure drinking water safety at all times.

The turbidity requirement referred to in the foregoing was to maintain 0.3 NTU, which the plant had demonstrated it was capable of meeting with its new modifications.

On July 13, 2001, another SERM employee spoke with Mr. Strelioff and reported to his supervisor as follows:

> How is response to SERM progressing? Randy [Strelioff] informed me that he had discussions with Merv Swanson that day that they were going to focus on meeting protocol requirements and were not going to focus on responding to Mark [Getzlaf]'s letter.

On July 18, 2001, Mr. Strelioff replied to Mr. Getzlaf with respect to the management issue as follows:

> Effective immediately MR2 McDonald and Associates will manage technical operations of water and wastewater facilities. This will be conducted by two telephone calls to the plant operators each day and one personal visit to the facilities each week.
>
> Effective August 13, 2001, Mike Rathwell will be manager, water and wastewater plants.

With respect to other requirements requested by SERM, the city took the position that if demands were not technically within the terms of the protocol, they should not be required in order to have the boil water order removed and could be performed at a later time. The city was understandably anxious to have the order removed. Some of SERM's additional requirements related to timing of the remediation efforts, while others related to ongoing reporting and performance requirements. The city's objection to the timing requirements was more justified than its objection to the reporting and/or the performance requirements that were intended to ensure safer drinking water.

Perhaps the most significant request made by SERM was that the surface water treatment plant be shut down if turbidity in the treated water was greater than 0.3 NTU, and the filter effluent diverted to waste. The city should report to SERM all instances where turbidity in the treated water exceeded 0.3 NTU for any twelve hour period or any time turbidity spikes exceeded 1 NTU.

SERM's reasons for requesting more commitment on some of the remediation timing issues are reflected in an e-mail dated July 22, 2001, from

Mr. Getzlaf to another SERM person in which he states in part:

> I do have serious reservations towards the City's commitment toward constant improvement which will cost them money. They also seem unaware of how well most other major operators run and maintain their facilities, and just how unique their rather poor approach to maintaining infrastructure and management has been. How they expected to run a very complex set of treatment facilities without a manager/foreman and City engineer absolutely floors me.

On Tuesday, July 17, Mayor Ray telephoned Mr. Muldoon, director of the environmental protection branch at SERM, and advised him that if the boil water order was not lifted by Friday, he would go to the media. Mr. Muldoon replied that the order would not be lifted and that more information would be required before it would be lifted. Either this date or the following day Mr. Toye telephoned Mr. Robert Ruggles, an assistant deputy minister in SERM, to make the point that requests were being made of the city beyond what the removal of the boil water order protocol required, and that the city was unhappy with these additional requirements. SERM insisted on certain of these additional requirements being met.

On July 20, 2001, the city replied to Mr. Getzlaf's July 12 letter requesting additional information. SERM replied the same day requesting still further information. On July 23, 2001, further inspection of the surface water treatment plant and the sewage treatment plant was carried out by SERM personnel. On July 24, 2001, a meeting between SERM and the city took place in preparation for the removal of the boil water order. This same date SERM advised the Battlefords Health District medical officer that it recommended the removal of the boil water order. In this letter Mr. Getzlaf stated in part:

> When the order is revoked, we recommend that a follow-up monitoring program be implemented for the City. From SERM's perspective, the monitoring program should include, in part, these key elements:
>
> - the City is required to continue to conform with monitoring and reporting requirements as specified in the existing Minister's Order and in

the operational procedure (revised one) prepared by MR2 [the consultant];

- SERM will continue to monitor the bacteriological results submitted to the Provincial Laboratory and take appropriate actions as required;
- the City is to submit the turbidity data to SERM for review every two weeks;
- every two weeks (more frequent if required) a conference call will be held between the City, SERM, and the Health District to discuss or update issues. This can be less frequent after two to three months;
- the City is to keep SERM updated when the significant items and/or upgrading works are completed;
- SERM will conduct an inspection of the three facilities within the two week period after the order is lifted and every month thereafter.

At the inquiry Mayor Ray indicated he still felt it was unfair that North Battleford had a 0.3 NTU requirement imposed on it by SERM as a condition for lifting the boil water order. Mayor Ray was asked:

> Q Well, can you tell us – can you give matters that were of concern to you in the way SERM behaved?

Part of the answer provided was as follows:

> A But it was pretty adamant by SERM that you're going to have to do a lot better than that. And we're looking at point three (0.3). And I can remember even Dr. Benadé raising the question of, well where – why are we going to point three (0.3) when the regulations say one? And what is it in other jurisdictions, like in the Province of Alberta and Ontario?

> And SERM indicated that they believed it was one, excuse me, as a standard. So Dr. Benadé was raising some concern about the levels they were requesting us to – to meet now. And I raised those issues as well. And eventually it ended up in our protocol agreement, at point three (0.3).
>
> Our council took some exception to that in that we were now going to be expected to be 70 percent better than anybody else in – in the province, running a similar plant. And we felt that if the guideline now was point three (0.3), we would meet it. But at the same token, that should be the guideline for the province. And I don't think that is the fact, yet.
>
> But it should – like it shouldn't be designated – we felt it was unfair that we would be singled out in the whole province, even though we had a problem. That if you felt the guideline was insufficient at one, change it.

It is difficult to read into the foregoing response any understanding that the type of water treatment required will vary with the quality of the raw water source. Likewise, there seems to be no understanding that the production of safe drinking water depends on scientific developments and best industry practices, rather than on an outdated and over-generalized guideline. The fact that 1 NTU is a guideline as opposed to a standard does not appear to have been considered in the foregoing answer. At the same time, the answer suggests the need to individualize water treatment plant requirements in the permit issued for plant operation. Each permit should be tailored to the treatment required for the particular raw water source. Placing performance requirements on the water treatment plant in the permit will avoid any confusion in the future with respect to what it takes to produce safe drinking water not only in North Battleford, but elsewhere in the province.

FINDINGS

27. The terms required by SERM in the protocol for removal of the boil water order were very appropriate.

28. SERM was right to resist pressure applied by the City of North Battleford to remove the boil water order before it was satisfied it was safe to do so.

RECOMMENDATIONS

10. **That in the future the performance requirements expected of a surface water treatment plant be itemized in its permit to operate, and include not only the parameters to be met, but also the quality assurance and quality control procedures that are to be in place.**

11. **To better ensure that surface water treatment plants remain capable in both infrastructure and operations year after year, that they be inspected by the regulator at least biannually by a person knowledgeable in surface water treatment best industry practices. This inspection should include: a record review to determine the level of compliance with the parameters for performance and sampling requirements set out in the permit; a review of the plant's processes and their operational effectiveness; an interview with the manager; and an interview with at least one operator.**

(a) **That a detailed inspection report be produced that records any non-compliance with permit requirements, recommends any improvements to be made and a timetable for the same, and**

offers an overall grading of where the plant fits in the spectrum of quality for surface water treatment plants.

(b) That a copy of the inspection report be delivered to the manager of the plant, to the city commissioner or his or her equivalent, and to the medical health officer for the health district.

(a) Adequacy of the City's Response

The City of North Battleford, over the eight months from April to December, 2001, has remedied, on the mechanical side, most of the deficiencies outlined earlier in the review of the surface water treatment plant. Both the plant and the protocols for its operation are now much more in accordance with present industry practice.

Dr. Stanley was asked by the commission to provide his comments on the changes that have been implemented and what, if any, concerns he would have with respect to the present state of the plants.

Dr. Stanley introduced his comments by making the point that when contamination of drinking water events occur, there is generally more than one reason:

> History has kind of shown us that it tends to be a combination of events that occur for these kind of contamination events.
>
> For example, when you start looking at, let's say, treatment performance, there may be a case where you do have a situation where, let's say for example, a process like filters aren't optimized for a short period. And that may occur and actually no event occurs, it's really a – a combination that occurs at the same time as some kind of challenge to that.
>
> So, there's – there's a case of let's say, a high loading in the raw water, plus you've got some difficulty with your treatment process. And really what tends to happen is treatment technologies and operations less than best practices tend to increase the risk.
>
> So, I've talked about it's very much an event related process. So what can happen is in many cases for – for months or even years, treatment technology used in the operations of those facilities may not have changed.
>
> And really what happens is that no event may occur, but when these combination of things occur, so you have a challenge to the plant, and then you have some difficulties with the

> treatment technologies or operations of the facilities, that's when a contamination event is – is – tend to – will tend to occur.
>
> The focus really right now, if you start looking at a lot of water treatment, in the industry right now is – is on a robustness of treatment. So, trying to come up with a treatment system that is robust, and that means that it is able to deal with all of the different types of raw water conditions that's going to occur, and – and be able to still produce very good water quality.

With the foregoing in mind, Dr. Stanley made several comments which may be summerized as follows:

(i) It would be more desirable if a rapid mixing process could be introduced to the chemicals prior to entering the SCU to improve the coagulation process.

(ii) The present practice of adding lime to the SCU as opposed to at a post-clarifier or post-filter stage renders the coagulation/flocculation process less optimal. Dr. Stanley indicated that sweep flocculation is best accomplished at a pH level of 6.5 or 7. One of the purposes of adding alum as a weak acid is to reduce the pH in the raw water to this level. The only purpose of adding lime to treated water is to bring the pH level back up to 8 in order to avoid corrosion in the water distribution system. Adding lime in the SCU is counterproductive, because it counteracts the alum.

(iii) Ultraviolet disinfection is quite a difficult process to operate, is reasonably high maintenance, and should have redundancies available for ongoing operations.

In a more general sense, Dr. Stanley indicated that the challenge come springtime for this plant will be whether or not it is able to produce enough water from the facility to meet consumer demand. Dr. Stanley indicated it is very difficult to optimize the facility in the fall for conditions that are going to be present in the spring or summertime when the river water will be far more turbid, and when large fluctuations in turbidity can occur on a daily basis. Dr. Stanley's point was that, without absolute optimization of the plant's processes, and optimization of operator training, the new protocols for shutting down the plant, or running water to waste from the SCU or the filters, will likely result in less water production. Another point made by Dr. Stanley was that the new protocols are going to be far more demanding on operator time. He indicated that during peak seasons EPCOR in Edmonton schedules more operators per shift than it does during slower periods.

Mr. McDonald indicated that the capacity of the ground water plant is limited by the capacity of the filters in the plant. The size of the building will not allow for increased filter capacity to be added, and in effect a new plant would have to be built to increase the ground water contribution to the city's water supply. What this means is that the surface water treatment plant will continue to be relied upon to supply any increased demands in water consumption. One of the questions Mr. McDonald raised is whether the city has sufficient reservoir capacity. It is generally agreed in the industry that short runs in the surface water treatment process involving shutdowns and startups every day, or more than once a day, is not a good quality control practice. Mr. McDonald's point was that, if there was more reservoir capacity, the necessity of such stop/start cycles in the surface water plant could be minimized well below what occurs at the present time.

It is noted the computerized record keeping system at the surface water treatment plant has not yet been addressed and is still operating with the same program.

The whole issue of what is the appropriate management structure for the plants department and what is the appropriate complement of operators to safely operate the plants has not been addressed. The evidence is that six of the present eight operators have passed the mandatory operator certification exams, at least four of whom are at the Class III level, which is the designated level of the surface water treatment plant. As noted earlier, a number of reports complimented the operators and credited them with the fact the plants were operational at all. Mr. Toye indicated that the city took some steps to alleviate the operator situation by hiring two additional workers to help out in high use periods in the summer of 2001. One was a former employee who had retired, and the second was a former employee who is a farmer. Hiring seasonal employees for high use periods seems to be a reasonable step, but raises the question if that is enough. In a letter to Mr. Getzlaf of SERM dated July 20, Mr. Strelioff mentioned two proposed additions:

> The City is considering adding a millwright (industrial mechanic) position to the present complement of eight plant

> operators. In addition, we may engage a janitorial company to assist with routine housekeeping and cleaning. These improvements will free up operator time to conduct the more rigorous operating and reporting requirements of the interim procedures manual and to provide some backup if an operator is uncomfortable undertaking some tasks alone.

The foregoing statement acknowledges that there will be greater demands on operator time under the new protocol. It is not known if either of the proposals have been proceeded with.

In a memo dated July 14, 2001, Mr. Getzlaf, in reporting to other SERM personnel, stated:

> I also brought up the issue regarding the fact that operator staff have mentioned to us recently that they have concerns about operating the plant alone. Rodger [McDonald] will discuss with Randy [Strelioff], but Rodger thought that with the new operating procedures in place and training on these procedures, along with emergency call back abilities within the City, safety concerns regarding insufficient numbers of staff on duty should not be an issue.

On July 17, Mr. Getzlaf, when reporting to other SERM personnel, stated:

> I am not sure what the policy is but it appears to me that having one operator working this type of WT plant is not enough. It sounds like the plant is manned from 8:00 a.m. to 4:00 p.m. by one guy and one guy from 4:00 p.m. to midnight. In watching Frank [Hollman] shut the plant down there is quite a procedure and it should be done very quickly. The phone was ringing, people were touring the plant, and it appeared very chaotic. I strongly think that a plant of this type and size should have two operators and should be manned 24 hours a day. I don't know but I think this should be discussed if it hasn't already. Frank felt this too.
>
> In talking with Frank it sounds like inconsistencies in flow rates/demand rates can cause problems with chemical feed rates and each time the plant is shut down it is quite a pain to

> get treating conditions fine tuned again. It sounds like the plant is shut down a lot or flow rates change a lot and so some one needs to constantly adjust chemical feed rates. Sounds to me like a potential for problems particularly with only one operator. In talking with Frank he said that operating the plant would be so much easier with another operator and if flows were consistent and also if one did not have to turn the plant on and off which happens often. Should not this type of water plant be left continually running?
>
> As well in discussions with him he told me that the intake in the river appears to be moving closer to the shore line or vice versa and that he knows for a fact that the sewage treatment plant flows do indeed go over the intake. I see this as a potential problem since the plant does not have U.V. installed yet and even if it did I still see it as a problem.

As far as the management component of the plants department is concerned, the evidence is that Mr. Katzell burned himself out acting as foreman over his 14 years. He went on stress leave in September of 1999, a year before his retirement, and when he retired he repeated why he was no longer capable of functioning as a foreman. There is nothing in the evidence that suggests city administration looked upon this other than as a personal failing of Mr. Katzell's, which of course it was not. As Mr. Katzell testified, he could not take a holiday or attend a course without increasing his work for a week in advance to prepare for his absence. He testified that, in the end, it simply wasn't worth being absent from the city.

The evidence is clear there is no one else in the civic administration knowledgeable enough to manage the plant in the absence of the plants manager. Even though the operators are qualified to operate the plant, a quality assurance program requires that competent supervision be available at all times to deal with the unforeseen. Mr. Katzell testified that with the multitudinous duties performed by operators in the plants department, including the operation of three different plants as well as maintenance activities, it was not possible to offer proper supervision in all instances. In Mr. Katzell's opinion this slowed down certain activities in the maintenance area as employees waited for instructions. The present manager will have all of the same pressures that Mr. Katzell experienced. Two of the operators who were offered the manager's position turned it down, which says a lot in itself.

There is a very real question of whether one single manager for the whole plants department is adequate. On the evidence it is not adequate, bearing in mind the purpose of management is to optimize the processes in all of the plants, all of the time, with a view to producing the safest possible water.

There is also a very real question as to whether the city should be hiring a professional engineer to take over overall management of the plants department. As Dr. Stanley indicated, the water and wastewater field is becoming more complex all of the time. He indicated that EPCOR, who manages the Canmore, Alberta, water treatment and wastewater treatment facilities for a population of approximately 10,000 people, has a professional engineer running the operation. Such an engineer in North Battleford would be in a position to also oversee the water distribution, sanitary sewers, and storm sewer systems that are presently in a different department. With a new sewage treatment plant proposed, such a person could be a valuable additional resource.

Senior administrators of the city stated several times in their testimony that it was the policy of the city to hire consultant engineers as required. The fact is, there was only one occasion when a consultant engineer was retained throughout the decade of the 1990s to look at the water treatment plants, and that was the Anthratech optimization study. Its recommendations were ignored. A city commissioner and an administrative public utilities director cannot be expected to know when it is time for such a review. The evidence establishes that senior administration was not interested in hearing from operators who had concerns. To expect that a non-professionally trained manager, no matter how experienced in operations, can have the breadth of knowledge and ongoing commitment to new developments to indefinitely operate the plants department in an optimal way is perhaps expecting too much. It remains to be seen whether a manager with the same status as Mr. Katzell would be any more successful than Mr. Katzell in obtaining what is required or necessary for improvements to infrastructure, equipment, or operating personnel.

In closing submissions the question was raised whether the time had arrived when operators should be specialized as water treatment operators or wastewater operators but not both. Counsel for the City of North Battleford was non-committal. Counsel for the operators stated his clients would be in favour of it. The suggestion was made recognizing the amount of specialized training that should be an ongoing requirement with respect to both types of facilities, and also in recognition of the fact that an operator who shows up at the surface water treatment plant once every eight weeks cannot be expected to perform as optimally as someone who is there on a full-time basis.

FINDINGS

29. The remediation work carried out at the surface water treatment plant since April, 2001, has corrected most of the deficiencies in the plant and equipment, and raised the capabilities of the plant to a capable industry standard.

30. The proposed installation of ultraviolet reactors at the surface water treatment plant is an effective supplementary treatment barrier that will greatly reduce the possibility in the future of *Cryptosporidium parvum* or *Giardia lamblia* entering the city's water distribution system.

31. The new quality control/quality assurance procedures introduced at the surface water treatment plant conform with best industry practices.

32. It is uncertain whether the plants department which retains the same number of operators and the same management structure as existed before the outbreak is adequately staffed and adequately managed.

33. It is uncertain if the City of North Battleford has sufficient reservoir capacity for its water distribution system.

RECOMMENDATIONS

12. That the City of North Battleford in the next six months:

    (a) install a supervisory control and data acquisition system (SCADA) in the surface water treatment plant;

    (b) retain a management consultant to assess the adequacy of the management component and the operator component of the plants department and to report within a further two months. It is recommended the report produced be tabled at city council as a public document, and a copy provided to SERM; and

    (c) commission an engineering study to determine if the city's reservoir capacity is adequate, bearing in mind the desirable goal of not operating the surface water treatment plant for short periods of time only.

(b) Adequacy of SERM's Response

SERM's response, from the time it was notified of a possible problem at the surface water treatment plant in North Battleford on April 24, 2001, to the removal of the boil water order on July 25, 2001, was timely and appropriate. SERM devoted the necessary personnel to satisfy itself that all steps required were being taken, and refused to bow to pressure to remove the boil water order sooner than it considered it appropriate to do so.

The November, 2000, Cabinet Decision Item (CDI) recommended SERM's request to "implement a monitoring and compliance program to conduct inspections on municipal/public water facilities and thereby ensure a comprehensive water quality program at all facilities." The recommendation included the hiring of nine additional persons to implement the program described as follows:

- A compliance review schedule for facilities will be developed based on risk management processes to pro-actively address water quality issues.
- Compliance activities will be based on SERM's monitoring and compliance model and will target non-conforming facilities to ensure that safe drinking water is available.
- SERM will provide technical advice to municipalities where appropriate.

Prior to the April events in North Battleford, SERM received funding to hire nine additional protection officers to work in its EcoRegions effective April 1, 2001. Three of these persons have been placed in the Parkland EcoRegion since April, 2001, and one of them is located in North Battleford. This person has a water treatment/wastewater treatment background. It is not, however, contemplated that the new officer will work only in the water and wastewater areas. Rather, he and Mr. Meekma will divide up Mr. Meekma's former work load and each of them will be involved in not only monitoring water treatment facilities but also performing the other duties required of an environmental protection branch officer in the EcoRegions.

In the CDI, SERM requested that an integrated provincial water quality database be developed. This proposal did not receive funding for the fiscal year 2001-02. Mr. Ruggles indicated the department has initiated some work on a new database design, and it will re-submit its budget request for the 2002-03 fiscal year. Mr. Ruggles indicated the enhancements they are looking for in such a new integrated system include the need:

(i) to integrate the database with both the provincial laboratory and SaskHealth so there would be a quicker flow of data between the three organizations;

(ii) to integrate the regions into the database in order that enforcement officers might access the data directly from the field; and

(iii) to crease a website that would post sampling data from the communities in order that it might be available to the public, and to also use the website to provide information related to the water treatment industry.

At the present time there is still no flagging system to identify communities that have not submitted the required samples, and consequently there is no organized follow-up on communities that do not do so. Failure to submit bacteriological samples has not been a problem in North Battleford, but is clearly a problem elsewhere in the province.

Mr. Meekma in his testimony indicated that, due to other work load requirements, even with the additional person in his office, they still are not able to conduct annual compliance inspections in the over 40 water treatment facilities in his immediate area. He did allow that when he was with the industrial branch, annual compliance inspections were conducted with respect to industrial facilities but there were far fewer of them.

FINDINGS

34. SERM's response, from the time it was notified of a possible problem at the surface water treatment plant in North Battleford on April 24, 2001, to the removal of the boil water order on July 25, 2001, was timely and appropriate.

35. The absence of a flagging system that would allow SERM to detect municipalities who do not comply with the requirements for submitting water samples is a serious shortcoming in its monitoring capability.

RECOMMENDATIONS

13. That the Government of Saskatchewan approve SERM's request to fund an integrated provincial water quality database in the fiscal year 2002-03.

14. That the new data system incorporate the permit requirements for each licensee with a flagging system to identify communities that have not submitted the required samples and produce a printout on a weekly basis of all such non-compliances.

  (a) That all non-compliances be followed up, within seven days, with the chief municipal administrator or his or her designate, who may not be the manager or other person operating the water treatment facility.

(b) **That with respect to a missed bacteriological sample, the municipality be advised to submit one within seven days. In the event the municipality fails to do so a PDWA be issued.**

15. **That in the event of persistent non-compliance by a municipality with respect to bacteriological sampling requirements, the regulator should appoint new management (see page 288), or should rescind the permit to operate the facility.**

2. Response by the Battlefords Health District

(a) Role as Investigator

The link between *Cryptosporidium parvum* and anti-diarreal sales had been made by Dr. Lipsett on the evening of April 12. This high sale of anti-diarreals was confirmed by Dr. Benadé at other pharmacies in the area within a day or two. A point that seems to have been missed is that the anti-diarreal sales made by pharmacies in North Battleford presumably included sales to persons who also lived in North Battleford. There was strong evidence of a diarrhoea outbreak in North Battleford before there was strong evidence of an outbreak in the Town of Battleford. There may have been good reason for investigating how many persons had shown up with enteric disease at the Battlefords Union Hospital in the previous two weeks, and for questioning physicians as to whether they had seen an increase in enteric disease in their practice, but the answers, when received, were not going to change the fact that on April 12 there was an outbreak of diarrhoea in North Battleford.

After two years of no cases of cryptosporidiosis in the Battlefords Health District proper, by April 12 there was evidence of two cases in one week. On the morning of April 17, it was decided to check the Town of Battleford's water supply. This inquiry recognized the possible link between the outbreak and a water supply. The Town of Battleford is a bridge away from North Battleford. Almost all services and shopping for both communities are located in North Battleford, which has ten times the population. Many people from Battleford work in North Battleford or go to school in North Battleford. Looked at objectively, it is not obvious what justified checking the water treatment facilities in one location and not the other, bearing in mind there was also a diarrhoea outbreak in North Battleford.

By the time the third case of cryptosporidiosis was reported on April 17, the Town of Battleford's water supply had been ruled out as a possible source and the investigator had reported no obvious connection between the second and third cases from Battleford. The investigator continued: "both reported many cases of diarrhoea illnesses in St. Vital's (Town of Battleford) and John Paul II Schools (City of North Battleford), respectively," and also went on to report "her mother had exhibited symptoms about one week before her and that many relatives also exhibited similar symptoms, however none went to a physician." At this point there were now three cryptosporidiosis cases in the community that could not be explained on the evidence that was available in regard to person-to-person contact, or food-borne contact. Dr. Benadé stated that, in his mind, he was not certain the outbreak was not viral in origin, which is much more commonplace. However, as the protocols emphasize, when after ten days there are three confirmed cases of enteric disease from a water-borne pathogen and no other explanation for an outbreak of diarrhoea in the community, the possibility of a drinking-water-borne pathogen should be considered.

The investigation was hampered because the questioning of the confirmed cases of enteric disease did not include a question as to where the person or persons had consumed drinking water other than in their home in the period of time before illness. Such questioning would have in each case pointed to North Battleford as a common factor.

By the time of the third case, and certainly the fourth case, a proper protocol would have devoted more human resources to conducting the investigation if indeed the cause of the enteric outbreak still seemed elusive. Mr. Startup made the point that it had occurred to him to interview some other persons who had experienced diarrhoea symptoms, but he did not have time to do so. Due to lack of resources, the fourth case was not interviewed for four days. In the 11 days between April 12 and April 23, there were, at most, a couple of hours spent on the investigation by public health inspectors.

The investigation was also hampered by the low number of stool samples requested from the patients experiencing diarrhoea. As noted above, only five stool samples were requested from 135 patients diagnosed with enteric disease at the Battlefords Union Hospital between April 1 and April 19, 2001.

There was no evidence at the inquiry that any other health district in the province would have done things any differently than was done in the Battlefords Health District. Indeed, the public health officer for the province described the investigation as "textbook." With the full benefit of hindsight, and the protocols for the investigation of water-borne pathogens referred to earlier, a number of improvements should be implemented in any future investigations of enteric disease outbreak where a suspected cause could include a water-borne pathogen.

As the protocols for investigation of water-borne pathogens emphasize, once a water-borne pathogen is identified in drinking water as a possible cause of an outbreak of enteric disease, substantial resources should be devoted to the investigation because of its potential to affect so many people in a short period of time. The protocols also emphasize the establishment of a permanent outbreak team for the municipality, which would typically include a representative of each of the municipality, health, and the regulator to both consult with the public health officer, and also to carry out investigations.

FINDINGS

36. The Battlefords Health District's investigation into the *Cryptosporidium parvum* outbreak was not a circumstance that added materially to the number of persons affected by cryptosporidiosis. By April 19, 2001, the outbreak had peaked one week earlier and the difference in the number of cases between April 20-24 would not have been material.

RECOMMENDATIONS

16. That a provincial protocol for water-borne disease investigation be prepared, distributed, and adopted by all health districts in the province and that this protocol include:

- **(a) the establishment of a task force in each district which is to be notified by the medical health officer, or in his/her absence a public health inspector, whenever the health district is experiencing an enteric disease outbreak that could be caused by a water-borne pathogen;**

- **(b) that this protocol emphasize that the first hypothesis to be tested is whether or not it could be a water-borne pathogen, which** means automatically checking with personnel at the water treatment facilities and with the regulator who should have a member on the task force;

(c) when cases appear which are geographically close to a regional centre such as North Battleford that any additional persons or family members identified by the confirmed case who have also experienced a similar illness be interviewed in detail as to when and where they have consumed water for the period of at least ten days before the onset of illness;

(d) that if the enteric disease reporting form is to continue to be used as a routine form, a new, much more detailed, form be available for use by investigators whenever the investigation involves a possible outbreak of water-borne disease; and

(e) when in any health district there is a difference of opinion or uncertainty based on the available evidence as to whether or not a PDWA or boil water order should be issued after consultation with the task force, the medical health officer should contact forthwith the provincial public health officer or deputy minister to seek advice.

17. That each health district establish sentinel pharmacies to report any increase in anti-diarreal medications. This is recommended by the Centers for Disease Control and Prevention in Atlanta, Georgia, and seems necessary when so many patients experiencing enteric disease self-medicate. This alert can also result in a request to physicians to increase stool sampling.

18. That a provincial protocol be developed for use by all health districts as to when stool samples should be requested from a patient and forwarded to a laboratory. The inquiry did not hear enough medical evidence to determine what such protocol should be, but clearly in this case there were not enough stool samples taken and the ability to diagnose disease was hampered.

(b) Public Communication

As reported above, the PDWA was issued April 25, 2001, (Appendix "E"). This document consisted of a media release, a one-page fact sheet on cryptosporidiosis, and a two-page document entitled "Cryptosporidium – Frequently Asked Questions." The boil water order was issued at approximately midnight on April 26. On April 26 and April 30, Dr. Benadé sent urgent memos to all physicians in the area reporting on the number of confirmed cases of cryptosporidiosis and requesting physicians to submit stool samples to the provincial laboratory.

The public health inspectors and Dr. Benadé emphasized the large amount of logistical work that is required in conjunction with a PDWA or a boil water order. At the time of the September, 2000, coliform event the health district had to start from scratch to develop a protocol to be followed to ensure timely communication to all businesses, citizens, and public facilities in the city. The public health inspectors proceeded to develop a contact list prioritized into high, medium, or low hazard facilities. Priority was determined on the basis of the type of facility involved, and its proximity to the contaminated area. Institutions such as hospitals, long term care homes, and schools were rated as high hazard, while food services and restaurants were seen as less of a risk.

September 15, 2000, was a Friday. That evening an ad hoc group consisting of health district employees and civic employees, including the mayor and members of city council, was involved in attempting to notify all relevant facilities including home owners. Not all persons were notified on the Friday night and some were missed in the process. There were a number of restaurants who claimed they had not been notified promptly enough, and there was a school in North Battleford that complained it had not been notified by Monday. In some of the cases where persons were not notified, it was due to the fact that health district personnel thought city personnel were looking after that area, and vice versa.

Following the September, 2000, event Mr. Piatt and Mr. Startup prepared a memorandum dated October 2, 2000, advocating a provincial protocol for such advisories and orders. This memorandum stated in part:

> A Provincial guideline for use by PHIs should be developed that specifies or includes the following:

a. A generic boil water notice

   i. how long to boil the water

   ii. acceptable uses for the water

   iii. precautions for drinking

   iv. precautions for washing foods and dishes

   v. use of coffee makers

   vi. use of in-line water filters and other in-home water treatment devices

b. Should include a priority contact list to inform public facilities (ie: who should we contact first).

c. Should specify who should communicate with the media (ie: the health districts, SERM, or the municipality).

d. Procedures required for facilities for the shutdown and startup of commercial coffee machines, pop machines, and slush machines etc.

e. Acceptable methods for notifying the residents (ie: who should contact them and in what manner – radio, tv, door-to-door).

f. Should specify who is on call and the hours they should man the phone to answer questions from the public and public facilities (ie: 0800 - 2100 hrs).

g. When and if follow-up inspections are required.

By April 24, 2001, the health district had the benefit of the September, 2000, experience and had accumulated a number of precedents in connection with that advisory. The health district also had more time to prepare, as it was known from the evening of April 24, 2001, that an advisory would be likely. On this occasion members of the Emergency Measures Organization were invited and present for the meeting which took place at 8:00 a.m. on April 25. As Dr. Benadé stated:

> It's one of the lessons we learned during the September, 2000, event. Communications being a big issue at that time, we had some challenges around communication and, in the post mortem, it was generally agreed that they could play a vital role in terms of getting the word out and making sure that we get to the target facilities as soon as possible.

On April 25 this was, in fact, what happened and there were no reported complaints about the timeliness of the notices received with respect to the advisory that was issued at 1:00 p.m. that day, nor with respect to the boil water order that was subsequently issued the next night.

For several days after the issuance of the order, public health inspectors manned telephones to answer inquiries from the public, and also did some compliance inspections to ensure that the boil water order was being carried out in public facilities. A major challenge for the city was delivering water to persons who were "shut-ins" in their own homes or apartments and this appears to have been accomplished. In the end, Mayor Ray stated he was very satisfied with the co-operation received from the health district with respect to the advisory and the order.

The recommendation made by Mr. Startup and Mr. Piatt that the province should develop a protocol to be available to all municipalities in the event it is required to issue an advisory or a boil water order is a good one. North Battleford had the benefit of a preview and was able to develop materials in advance of the April, 2001, outbreak, but it was still a very onerous logistical exercise for the health district and the city.

FINDINGS

37. Communication of the PDWA of April 25, 2001, and of the boil water order of April 26, 2001, to the community of North Battleford was timely and comprehensive.

RECOMMENDATIONS

19. That the provincial Department of Health prepare for distribution to all health districts guidelines, including sample documents where appropriate, for all action to be taken by a health district once a PDWA or a boil water order is issued. The guidelines should cover the points outlined in the memorandum dated October 2, 2000, prepared by the public health inspectors. (See page 190)

(c) Communicable Disease Administration

In the wake of April, 2001, Mr. Startup has been designated the enteric communicable disease coordinator with responsibility for investigation of all enteric disease reported in the health district. This is intended to avoid the scenario that occurred with the first two cases of cryptosporidiosis where the investigator of the second case was not aware of the first case.

The health inspectors have developed a new database that is on-line and accessible to all health inspectors and the medical health officer. The other health inspector, Mr. Piatt, is responsible for maintaining this database and entering the reported information on all investigations carried out by Mr. Startup. This is intended to act as another set of eyes reviewing the material.

Although the Battlefords Health District has taken steps to avoid in the future any delays in the investigation of enteric disease caused by administrative procedures, it is considered appropriate that the benefit of the experience be available to all other health districts.

RECOMMENDATIONS

20. That each health district put in place a system that requires:

(a) that all reports from laboratories identifying enteric disease be reviewed daily between Monday and Friday, whether the communicable disease coordinator is present at work or not;

(b) that instances of enteric disease be recorded in the communicable diseases log on the date the result is submitted, not the date a person recorded it;

(c) that one public health inspector assume the primary role for investigating enteric disease, with a designated alternate for when the primary investigator is not available;

(d) that the primary and alternate investigator receive training additional to other public health inspectors in the investigation of enteric disease, and in particular in interviewing techniques; and

(e) that each district establish a contingency plan that will mobilize a number of additional persons to the investigation team in the event of an outbreak. The logical persons to be so added would be public health nurses who also have some training in interviewing techniques.

21. That public health officers for the health districts be briefed annually by a SERM representative for the purpose of learning the state of water treatment systems in the district, and what the potential may be for problems that might lead to disease.

PART VI - POLICIES, GUIDELINES, PROCEDURES AND PRACTICES RELATED TO DRINKING WATER PRIOR TO APRIL, 2001

1. The City of North Battleford

The obligation on a municipality to provide potable water to its population is contained in s. 14 of *The Public Health Act, 1994* which states:

> 14(1) The council of an urban municipality, a rural municipality in which a hamlet is located or a town within the meaning of *The Northern Municipalities Act* shall ensure that there is a supply of potable water and a system for the disposal of sewage for use by the inhabitants of the urban municipality, hamlet or town, as the case may be.

Section 15 is a prohibition section and states:

> 15 No person shall make available to the public a water supply that is not potable unless:
>
> (a) the public is clearly advised:
>
> (i) that the water is not potable; and
>
> (ii) of the uses to which the water may safely be put; or
>
> (b) the regulations authorize it.

The city did not have any written policies with respect to the production of potable water. Prior to the April, 2001, *Cryptosporidium parvum* outbreak there was no quality control/quality assurance program or manual with respect to the operation of the treatment plants. Each of the city management persons who testified indicated they relied completely on Mr. Katzell, the foreman of the plants department until his retirement in December of 2000, and after his departure on the operators to produce safe drinking water. They uniformly testified they did not know how these persons were meeting this challenge. The unwritten city policies that may be inferred from the evidence outlined in the section on the plants department include:

(a) A policy to treat the plants department, which included the water treatment plants, exactly the same as all other public works departments as far as expenditures were concerned;

(b) A policy not to spend any money on equipment or infrastructure that was not absolutely necessary;

(c) A policy that regarded annual upgrades to the distribution system that delivered the drinking water as reasonably necessary, but did not extend to the two water treatment plants and the sewage treatment plant;

(d) A policy that regarded water utility rates as a tax, and therefore to be minimized as an end in itself;

(e) A policy to do without professional engineering advice in the operation, as opposed to the administration, of the public works department;

(f) A policy to leave matters of administration to the administrators without providing guidelines on how the administrators' jobs should be performed or what information council should receive;

(g) A policy of delegating the city's responsibilities to produce potable water to the foreman, and then directly to the operators to perform without providing knowledgeable supervisory or professional support;

(h) A policy of ignoring SERM's request for action with respect to the plants. This is evidenced in City's non-responses to SERM with respect to the sewage treatment plant, and after the September, 2000 coliform event, its non-response to SERM's request to have a performance evaluation done on the surface water treatment plant.

FINDINGS

38. There was a systemic failure on the part of the City of North Battleford to recognize its responsibility to produce safe drinking water. This failure was brought about by the City's collective lack of knowledge on what it takes to produce safe drinking water, and policies that discouraged the possibility it might acquire such knowledge.

2. The Battlefords Health District

(a) Water Compliance Activities

As noted earlier, the public health inspectors in each health district are responsible for water systems producing less than 18,184 litres per day. The policy of the Battlefords Health District was to inspect each water system annually, and Mr. Koroluk indicated that, up until the year 2000, they were able to achieve 95% of this goal in most years. In the year 2000 the health district developed two vacancies in its five-person complement. Thereafter the percentage of inspection activity dropped off. However, with the development of the interim bacteriological response protocol in June of 2000, the public health inspectors, who had on average issued one boil water order per year, issued ten such orders in the period June, 2000-2001, including the two for the City of North Battleford.

The practice on inspections was to interview the operator, review the records with respect to chlorine residuals, and attempt to determine if there were any problems with the system. If a community had not been submitting its bacteriological samples, it was encouraged to do so. Following a site visit, the inspector would in most cases discuss the results of the inspection with the local municipal administrator. The inspector would prepare a report, and copies of this report would be provided to the operator, the municipality, and SERM.

The health district's concern with the health aspects of drinking water was reflected in Mr. Koroluk's letters of March 5, 1997, and April 10, 1997, written to SERM and Sask. Health (see pages 232 and 234). The topic of both was inspection of smaller water systems that did not fall under the jurisdiction of health. Likewise, Mr. Koroluk wrote a letter to SERM dated September 14, 1998, pointing out that mandatory certification of operators would not justify SERM eliminating its field inspection program after September 14, 1998. This letter made the point that the Department of Health legislated requirements for trained operators of swimming pools and eating establishments, facilities that were not free of operational problems.

On May 30, 2000, after Walkerton, Dr. Benadé and Mr. Koroluk addressed a memo to the CEO of the Battlefords Health District expressing their concerns about bacteriological sampling non-compliance by the smaller communities regulated by SERM. At this time each health district received copies of results of water samples, but if a community did not submit samples, SERM was not following up. The conclusions section of the memorandum stated as follows:

> - Water quality in many areas of Saskatchewan is managed inadequately.
>
> - Risk exists for the occurrence of water-borne disease in some of the smaller municipal water systems due to the variables outlined above.
>
> - The District is not likely to be the cause of an outbreak, but will be expected to control any outbreaks that do occur.
>
> - The District would currently not be aware that a municipal water supply is a health hazard until notified by the municipality or SERM, or an outbreak of disease was epidemiologically linked with a water supply.

The foregoing memorandum was passed along by the chief executive officer to the Department of Health. He pointed out that if SERM's proposal that it not monitor municipal water systems that do not routinely submit water samples was allowed to pass, it would place an added burden on health district personnel whose obligation it was to monitor health hazards. SERM's proposal was not acted upon by the Department of Health prior to April, 2001. The bacteriological response protocol did not address the issue of non-compliance by a municipality in submitting the required water samples.

FINDINGS

39. The Battlefords Health District was conscientious in its role as the regulator of small non-municipal water systems. It not only conducted annual inspections but also provided advice to operators and municipalities when appropriate. The health district also fulfilled its health advisor mandate by notifying the provincial regulators of perceived gaps in the compliance system and of potential health hazards associated with the treatment of drinking water in the health district.

40. The shortage of public health inspectors, as evidenced by the inability of the health district to hire two replacement public health inspectors in the seven or eight month period ending with November, 2001, is a cause for concern.

RECOMMENDATIONS

22. That the provincial government take steps to ensure a better supply of public health inspectors in the province of Saskatchewan. These steps should include either greater educational opportunity for persons wishing to become public health inspectors to be educated in the province, or financial assistance for those persons who must leave the province to obtain the appropriate education.

(b) Communicable Disease Investigation

Apart from the large hospitals in the urban centres of Regina and Saskatoon who have their own laboratory facilities, most of the analysis of samples for communicable disease is performed at the provincial laboratory in Regina.

Evidence at the inquiry was that the provincial laboratory would notify the health district of the results of any lab sample that disclosed a reportable communicable disease by fax the same day. The health district had designated a public health nurse as communicable disease coordinator, and a dedicated fax machine was available on her desk to receive such reports. Once received, the coordinator would enter the information into the communicable disease log maintained on her personal computer. If the report of disease required investigation the coordinator would give the information to one of the two public health inspectors, depending on which area in the health district the reported case resided. The health inspectors divided up the district geographically with each one taking approximately one-half of the city and one-half of the rural area. If one inspector was away for an extended period, the other would deal with all reports. There was no time limit within which the inspector should complete the investigation but such investigations were at the top of the health inspector's priority list, and often they were done the same day.

If the coordinator was away from the office for a day or more, a nurse in the next office was supposed to check the fax machine on a daily basis. However, this system did not always work as intended. As noted under the investigation section, a case of cryptosporidiosis reported to the Battlefords Health District on April 5 was not handed to a public health inspector until April 10 as the coordinator was absent from the office on two working days in the interval.

The communicable disease log was not available by remote means to the health inspectors or Dr. Benadé. If for any reason these persons wished to look at the disease log they would have to access it through the coordinator's computer.

The public health inspectors and the medical health officer were located on the same floor as the communicable disease coordinator and there was opportunity for informal conversation between them on a regular basis.

With respect to enteric disease, the inspectors had an enteric disease reporting form that they used as a checklist. They also had a manual in the office that identified the communicable diseases they could be dealing with. If the inspector was not familiar with the disease, he would read up on it in order to provide relevant advice when doing the follow-up investigation. Most follow-up investigations were conducted by telephone. Mr. Startup indicated he rarely pinpointed the source of the disease if it was a single case. At the conclusion of the interview with the person affected, a report was prepared and returned to the coordinator for distribution back to the laboratory, the provincial epidemiologist, and to the medical health officer.

Mr. Startup indicated that, in a routine case, Dr. Benadé would not be consulted. *E. coli* was not considered routine and he would be notified forthwith of any such case. Dr. Benadé was not informed of the first two cases of cryptosporidiosis reported and investigated in the health district prior to April 12, 2001. Mr. Startup indicated he had no previous experience with investigating a water-borne outbreak of enteric disease. He had participated in two previous investigations that turned out to be food-borne outbreaks.

FINDINGS

41. The Battlefords Health District policies for the investigation of enteric disease focussed on routine investigations only. The district did not have a policy directed at how an enteric disease outbreak in the community should be investigated.

3. Department of Saskatchewan Environment and Resource Management

(a) Responsibility for the Regulation of Drinking Water

Prior to 1984, both Saskatchewan Environment and Saskatchewan Health were involved in regulating the water treatment industry. Saskatchewan Environment administered the waterworks regulations, which included the approval and licensing of waterworks. It had a water pollution control branch that issued permits to operate waterworks and waste waterworks, and its staff offered a certain number of training programs, and provided technical assistance when requested. This staff also responded to problems identified by health inspectors in the course of their inspections. Saskatchewan Health carried out the inspection and monitoring of water treatment facilities.

In 1984 the Saskatchewan Government effected a reorganization and rationalization of its environmental legislation, including regulatory responsibility for water. It passed *The Water Corporation Act*, S.S. 1983-84, c. W-4.1 which established the Saskatchewan Water Corporation as a Crown corporation to be responsible for water management issues that were formerly located in other government departments. The same year *The Environmental Management and Protection Act*, S.S. 1983-84, c. E-10.2 (EMPA) was passed effective July 1, 1984. This *Act* gave Saskatchewan Environment responsibility for the general supervision, control and regulation of all matters concerning water quality and water pollution. New water pollution control and waterworks regulations were passed effective June 13, 1987.

Mr. Robert Ruggles, assistant deputy minister of SERM responsible for the programs division testified that the primary reason for moving the field program from the Department of Health to SERM's predecessor in 1984, was that municipal waterworks and waste waterworks were not receiving sufficient attention in terms of meeting regulatory requirements and it was decided a more aggressive program with more compliance activities was required.

Effective April 1, 1993, the Department of Saskatchewan Environment merged with the Department of Natural Resources to form the Department of Saskatchewan Environment and Resource Management (SERM).

SERM regards its mandate with respect to protection and management of water quality in the province as set out in a document submitted by the government to the inquiry summarizing the legislative framework for delivery of waterworks and sewage works programs in the province. It states:

> *The Environmental Management and Protection Act* (EMPA) is the focal piece of environmental legislation administered by SERM and houses the central regulatory powers, duties and functions as regards water quality protection and management. EMPA has been assigned to the Minister of Saskatchewan Environment and Resource Management and confers on that minister broad supervisory and regulatory powers and control over "all matters concerning water quality and its impairment by pollution".
>
> For the purposes of carrying out those duties and exercising those powers, the minister may:
>
> - undertake and coordinate research, investigations and planning with respect to water quality and water pollution;
> - consult with SWC;
> - maintain close touch with the Prairie Provinces Water Board and like organizations;
> - obtain, collect, process, and store data on the quality of water resources in Saskatchewan;
> - sponsor and undertake research on water quality, water resources, and water treatment;
> - enter into agreements for the collection, processing, and reporting of water quality data;
> - when requested to do so, make available to the public or other government agencies information relating to the quality of water resources of Saskatchewan.

Quite apart from the regulation of drinking water, the Minister of SERM has broad responsibilities with respect to the protection and management of water sources (surface water and ground water) and has been given regulatory powers to prevent, monitor, and supervise overall surface water and ground water quality and its impairment by pollution. These programs relate to aquatic nuisance control, municipal and industrial effluent discharge, protection of water quality for all uses, landfills, liquid waste haulers and water quality protections and controls from mining operations. Section 18.1 of EMPA is an example of regulatory control over source water protection.

Section 38(1) of EMPA authorizes the minister of SERM to enact regulations with respect to waterworks.

> 38(1) The Lieutenant Governor in Council may make regulations:
>
> (e) prescribing standards and authorizing the minister to prescribe standards for the design, construction, installation, alteration, extension, operation and monitoring of industrial effluent works, sewage works and waterworks where those standards are required for the protection of the environment or the public health.

The Water Pollution Control and Waterworks Regulations, R.R.S. c. E-10.2, Reg. 2, ("Waterworks Regulations") are passed pursuant to s. 38 of EMPA. Part 3 of the regulations are the chief source of SERM's regulatory control over waterworks and Part 4 of operator certification. Part 2 of the regulations deal with sewage works. In SERM's own words, "the regulations can best be described as 'performance based', that is municipalities and the regulator gauge operational performance by the quality of the treated water."

FINDINGS

42. EMPA and the *Waterworks Regulations* provide SERM with the jurisdiction to comprehensively regulate drinking water in the province.

(b) Reduced Budget Choices

Before the merger of the Environment Department and the Natural Resources Department, their combined annual budget was $113 million. In the fiscal year ending March 31, 1996, SERM's budget was set at $94.6 million, a reduction of $18.4 million. In the fall of 1995, SERM received an early indication that its 1996-97 budget would be further reduced from 1995-96 levels. This triggered a program review in the department. As a result of this program review, and recognizing that there would not be any additional money for field inspection, the department recommended proceeding with a mandatory operator certification program for the 1996-97 budget year. Treasury Board reviewed SERM's 1996-97 budget submission. The request was for $466,000 in 1996-97 to implement the program and thereafter an estimated annualized cost of $216,000. Treasury Board stated on November 9, 1995, "finance recommends that the introduction of mandatory water/wastewater operator certification and the incremental funding be denied" and idicated that "finance recommends that SERM and Sask Water prepare a joint report for Treasury Board finalization, identifying the viability of consolidating and/or transferring functions and any associated savings."

On November 14, 1995, the secretary of the Treasury Board wrote to the deputy minister of SERM and stated in part:

> As you are aware, the projected fiscal situation has changed subsequent to your initial budget direction. Accordingly, Treasury Board has requested that further options be developed.
>
> The Department of Environment and Resource Management is directed to prepare further options that will reduce the Department's 1996-97 expenditures by an additional $6M from the Finance recommended budget of $90.9M, beyond the recommended communications reduction presented to Treasury Board by Executive Council.
>
> Treasury Board has requested that the Department provide recommendations on the elimination of lower priority programs and realignment of departmental functions to achieve the requested additional $6M reduction, and has expressed a strong preference for options that would have ongoing savings as opposed to one-time savings.

Mr. Ruggles indicated at the Inquiry that the additional reductions were being driven by reductions in federal transfer payments to the province for the upcoming fiscal year.

Faced with this further reduction in its overall budget requirement, SERM decided it would exit from its field monitoring, advising, and inspection activities in the water and wastewater program. Mr. Ruggles indicated the department rationalized that it would henceforth maintain its capacity to develop standards and guidelines, but reduce its monitoring role to one of monitoring compliance of sample submissions required by the various facilities in their operating permits. It was also proposed to retain the data management unit to track results of samples so it would still be in a position to advise communities when concerns arose with respect to water testing results. Under this proposal the only staff remaining would be in central office in Regina.

SERM proposed to Treasury Board the elimination of the eight regional officers plus three additional positions as a means of saving $700,000 per annum. Included in this $700,000 was withdrawal as well from the voluntary certification program for operators. One of the three positions to be reduced was the person who ran this program. SERM's rationale was that the required advisory services were available in the private sector. As far as the withdrawal from the voluntary training program was concerned, it stated in its submission that: "without mandatory certification WMC, the Water and Wastewater program will not be of a significant benefit to keep operating on a voluntary basis, in that those who will voluntarily seek upgrading is not likely to increase." This Phase II proposal was dated November 17, 1995. A response was received from Treasury Board November 27, 1995. Finance recommended "that the reduction in municipal water/wastewater advisory services be approved for savings of $635K but that the voluntary training and certification program be retained at a cost of $65K and 1.0 FTE [full time equivalent]."

The final 1996-97 budget was set at $86.8 million, a net reduction of $7.8 million from the 1995-96 funding level. This budget reflected a staff reduction of 92 FTEs. The environmental protection branch, which included industrial and commercial resource officers as well as the eight municipal resource officers, was told to effect $1.5 million in reduced resourcing, which translated into 25 FTEs of staff. In the end the environmental protection branch was given the discretion to apply the required reductions as it saw fit to minimize risk to programs.

In the fall of 1999, SERM prepared its budget proposal for the fiscal year April 1, 2000, to March 31, 2001. In its budget proposal, it suggested eliminating the drinking water standard program to achieve a cost savings of $350,000 and affect six full time equivalent persons. Its rationale for making this recommendation was again driven by a request from Treasury Board that the department look at opportunities to reduce expenditures. Commentary offered by SERM in its budget review document is hereinafter set out verbatim:

> Description
>
> Municipal drinking water quality protection is part of SERM's mandate as set out in the Environmental Management and Protection Act (EMPA) and The Water Pollution Control and Waterworks Regulations.
>
> Under EMPA and the Water Pollution and Waterworks legislation, SERM has the obligation of setting standards and monitoring, with respect to water quality, all municipal water systems, and all private and government water systems utilizing capacities greater than 18 cubic metres per day. SERM is also responsible to collect, process, and store data on water quality in Saskatchewan. Over the years, due to budget reductions, this program has been tailored back to compliance inspections focussing on those communities where there are pressing drinking water quality issues. In February 1999 Cabinet directed SERM to make the certification of water and wastewater works operators mandatory. SERM has and will continue to work closely with the Saskatchewan Urban Municipalities Association, Saskatchewan Association of Rural Municipalities, the Saskatchewan Institute of Applied Science and Technology, the Saskatchewan Water and Wastewater Association, the Operator Certification Board (established under Ministerial Order) and Saskatchewan Water Corporation in ensuring the successful implementation of the mandatory certification program. This will also allow municipalities to understand the importance of protecting water quality. SERM is planning to decrease costs involved in monitoring water quality to meet the 2000-01 financial target by handing over the responsibility of protecting water quality to respective municipalities.

Impact on achieving Strategic Goals and Objectives

Handing over the responsibility of protecting water quality to respective municipalities will have an impact on our strategic goal of ensuring a clean and safe environment. Absence of regulation enforcement and monitoring Drinking Water Program will decrease our ability of ensuring Clean Water (Objective #1), Protecting Biodiversity, Natural Habitats and Ecosystem Health across the Provincial Landscapes (Objective #6) and Increase Economic Benefits Based on Sustainable Use and Development of Parks, Forests, Crown Resource Lands, Fish & Wildlife (Objective #9).

Other implications

- SERM will not be meeting its mandated and legislated responsibilities. No other provincial Saskatchewan department is currently mandated to deliver this program.
- Communities will no longer have access to the expertise in the drinking water program.
- Without active management of the program, the health of people with some Saskatchewan communities will be at risk.
- Vacating this program area would conflict with several proposed actions under the Water Management Framework which was approved by Cabinet.
- The provincial data base will no longer be kept current and the tracking of drinking water quality within Saskatchewan communities will no longer be possible.
- Extensive negotiations and cabinet direction would be required to have this program continue to be delivered by another government department.

- Saskatchewan Health has a strong interest in linking SERM's water data base with Health to examine/analyze linkages between water and health issue occurrences in Saskatchewan.

The Treasury Board responded to this recommendation as follows:

> Under the Environmental Management and Protection Act (EMPA) and The Water Pollution Control and Waterworks Regulations, the Department is responsible for:
>
> - setting standards and monitoring water quality for all municipal water systems and all private and government water systems utilizing capacities greater than 18 cubic metres per day; and,
> - collecting, processing, and storing data on water quality in Saskatchewan.
>
> According to the Department, it recently has narrowed its focus to compliance inspections where there are pressing drinking water quality issues. Currently, the Department is proposing to delegate responsibility for protecting water quality to municipalities. Municipal governments have legislated responsibility to provide potable drinking water. A 1995 report on municipal drinking water quality estimated that approximately 75 per cent of the population in Saskatchewan had a water supply that met the Municipal Drinking Water Quality Objectives and had adequate treatment. SERM's responsibility for setting standards and providing technical expertise would be diminished. According to the Department:
>
> - the absence of provincial involvement may result in some increased fragmentation, less consistency, and less centralized knowledge and expertise on a provincial basis;
> - the elimination of this function goes against the goals and commitments in the Water Management Framework in which one objective is to enhance safety of municipal and domestic drinking water supplies;

> - the Government may be criticized for reneging on promises made during uranium environmental reviews;
> - tracking of Saskatchewan's water quality would no longer be possible; and,
> - legislative changes would likely be required.
>
> Finance notes that no one else in government monitors/tracks Saskatchewan's drinking water quality. This in turn will affect how the Department tracks its performance in regards to the drinking water portion of its Clean Water goal. Eliminating this program would provide $350K in savings and 6 FTEs. The Department has not listed this as an additional priority above its target.
>
> Recommendation:
>
> Finance recommends Treasury Board tentatively approve the elimination of the Drinking Water Standard Program which will provide a cost savings of $350K and 6 FTEs pending advice from Sask Water, Health, and Municipal Affairs, Culture and Housing.

Neither the Department of Health nor the Department of Municipal Affairs, Culture and Housing agreed with the proposal put forward by SERM to drop the drinking water standard program. Both departments replied expressing surprise that they had not been consulted in advance of the proposal.

In a letter dated December 23, 1999, the deputy minister of Health wrote to the deputy minister of Finance pointing out that the 25% of the population in Saskatchewan whose water supply did not comply with water guidelines resided in small communities who have limited capacity to deal with water issues without the support of SERM. The letter went on to point out:

> If water safety is not monitored adequately, concerns will only become known after water-related illnesses have occurred. Dealing with such issues after the fact rather than through preventative actions places the public at risk.

An acting assisting deputy minister of Municipal and Community Services (MACH) wrote to Finance in a letter dated December 29, 1999, and was much more pointed in his criticism of the proposal. This letter states in part as follows:

> 2. My recommendation is that MACH not support this proposal for the following reasons:
>
> - Delegation of this responsibility to municipalities means there could be no consistent drinking water safety standard across the province.
>
> - There is a conflict between the roles of providing and paying for an essential service and setting minimum standards and monitoring/policing the service. This change wouldn't be consistent with the public interest in this respect.
>
> - Only a minority of municipalities as they are presently constituted will have the technical expertise to assume this responsibility at this time. Expecting each little municipality to maintain this expertise is unrealistic within the present structure. It would also not be cost effective.
>
> - The 1995 study of drinking water quality, which MACH was involved in, found that there already were significant deficiencies. If anything, SERM should be allocating more resources to the function.
>
> - SERM's role is supportive of meeting the population's need for infrastructure that serves priority needs such as health and safety.
>
> 3. I understand that Saskatchewan Health have health concerns about this proposal. Perhaps consideration should be given to transferring the responsibility for water and sewer standard setting to Health and the responsibility for monitoring and policing to Health

> Districts. Health and safety are the major reasons for the function in the first place, as opposed to environmental concerns. The requirement to provide potable drinking water is under *The Public Health Act.*

The proposal did not proceed.

Mr. Ruggles, in his examination and cross-examination, did not explain why the drinking water standard program was singled out for a reduction of $350,000, as opposed to the reduction being achieved in other areas of SERM activity. He was asked:

> Q Okay. I guess what intrigues me as a – as a citizen and unfamiliar with government, it seems like you're bringing out a – a pretty major hammer in terms of the water program, emasculating it to save three hundred and fifty thousand ($350,000) dollars and six FTEs. Would you agree with that characterization?
>
> A Well its the – the budget process that we operate under takes us to those kinds of proposals. As I said earlier, we – we get initial direction on a budget target and so we are forced as a department to look within and across all our programs and do an analysis, an evaluation of where the potential savings occur. It's not an enjoyable process but it's a real process.

Earlier Mr. Ruggles was asked:

> Q I guess what my concern is – is, given the position that Health took in this matter in respect of health and safety, how did SERM, even with limited resources, justify taking forward the kind of proposal which it was taking to Treasury Board?
>
> A Well, the way the proposal was – was included in – in the initial budget process was, as I said, one of the many potential program reductions the Department looked at to meet budget requirements. At the same time, when we make proposals like that, we do an

> analysis and reflect the – the advantages /disadvantages of any of these proposals and – and those disadvantages associated with this particular proposal were – were well documented and it's part of the duty of the Department to – to do that analysis and to make ultimately ministers aware of the implications of these kinds of proposals; that's what was done in that particular proposal.

The answer to why the drinking water program was not protected was identified in an e-mail sent by the director of the Parkland EcoRegion to the assistant deputy minister of operations and to Mr. Ruggles as assistant deputy minister of the programs division as well as others on May 26, 2000. The second paragraph of this e-mail indicates the differences of opinion within the Department with respect to the drinking water program. The e-mail is worth setting out in total:

> The sad story unfolding at Walkerton, Ontario underscores the importance of having our "house in order" on the drinking water front. There is nothing more important in our business as environmental managers than to ensure human health and safety.
>
> I have never been comfortable with our overall approach to drinking water in SERM. We've got the full array of views among senior managers from those who think we shouldn't be doing anything with this program in SERM, to those who think we've got a "mature program", to those (like me) who think this is among the most important things we should be doing. [emphasis added]
>
> If it's our mandate, we've either got to deliver it ourselves or develop a partnership with another agency like Health for delivery. But we can't hand it off simply for the sake of handing it off. Whichever agency delivers the program, they've got to have the horsepower to do it; at the end of the day, the provincial government has a responsibility for safe drinking water.

> The sooner we develop a long-term plan for regulating Saskatchewan's drinking water program, the better I will feel.

Mr. Ruggles, having this e-mail pointed out to him, was asked:

> Q So there was a divergence of opinion within the Department as to where you should be going, the priorities which should be given, and the role that should be played in drinking water safety?
>
> A Yes, there was certainly some – some different perspectives or views from different senior managers in the department, yes.

In fairness to Mr. Ruggles, he wrote back to the director of the Parkland EcoRegion as follows:

> It is part of our mandate and I believe a better/stronger partnership with Health is needed. From my foxhole the Dept is doing the right things in setting standards and objectives, mandating operator certification, providing tech assistance etc. The program is not "mature" as some would say. I also believe communities generally don't need us to hold their hands forever. I would focus first on improving sample submissions and second on a streamlined data system which depts and communities can use. What appears to be negligence at Walkerton is inexcusable and should never happen here. I will discuss the program needs with Joe [Muldoon] asap and report back to you all.

Mr. Mark Getzlaf, the manager for the Environmental Protection Branch of the Parkland EcoRegion, in reply to his director with respect to the e-mail of May 26, 2000, referred to above, noted as follows:

> I hate to say it, but I think we have a long way to go to guarantee, as the primary regulator, that such an event won't occur in Sask. Operator certification is not the only answer (Ontario has a mandatory certification program, and guess what). Also, we no longer offer technical assistance, so small communities are on their own due to our cut-backs in this area.

We also no longer have a comprehensive review process, as we had before. As discussed in the Drinking Water Delivery and Compliance Protocol (yet to be actually condoned by senior management), the following explains how things have changed. "In the past SERM has taken the approach of managing all facilities rather than focussing on problem sites. As a means of achieving compliance, SERM had a very extensive compliance inspection program that monitored all communities. This program also involved comprehensive followup activities such as providing technical assistance and troubleshooting services...SERM reorganized in 1997 which resulted in staff going from specialists to generalists with their program activities changing and expanding to incorporate other environmental activities." "Due to the department re-organization in 1997, each EcoRegion seems to have their own agenda regarding positive bacteriological follow up."

We also continue to have a fair amount of non-compliance, which needs to be further addressed. An internal workshop to establish our minimum role (in keeping with our delivery abilities), supported by senior management, will make me feel a lot more comfortable about the extent of our involvement and will help relieve staff's concerns respecting personal liability delivering this program. We've got to get the above noted protocol reworked so it is deliverable and approved by senior management.

FINDINGS

43. The Government of Saskatchewan, represented by the Cabinet Ministers who constitute the Treasury Board, was aware that SERM's choice to withdraw from water quality management of water treatment plants throughout the 1990s would result in SERM not meeting its legislated mandate to regulate drinking water in the province.

(c) Organization

As a result of assuming overall responsibility for the regulation of water quality and water pollution, SERM's predecessor in 1984 was given approval to establish eight regional offices throughout the province staffed by an environmental officer for each region whose duties were solely the regulation of water and wastewater in the region. Each region had approximately 55 communities. In a letter dated March 17, 1986, the director of SERM's water pollution control branch outlined the responsibilities of the regional offices to include:

- providing on-site municipal water/sewage operator training;
- performing compliance inspections at water/sewage works to ensure the regulations and standards are met;
- providing emergency inspection, investigation, and recommendations in the event of a problem at a municipal water or sewage system that is likely to cause an environmental or public health problem;
- investigating water quality/water pollution complaints; and
- sampling the province's primary water quality network and performing industrial inspections and effluent sampling.

The eight regional environment officers were trained to a level to perform the foregoing tasks.

The initial goal was for each regional environmental officer to make two annual visits to each waterworks and one to each sewage works. In 1984, province-wide there were approximately 550 waterworks and 500 sewage works. The standards and approval section in Regina continued to develop the licenses for each facility but did so in consultation with the regional officer.

Prior to 1984, the Environment Department had established two databases in the department. One of them was ESQUADAT, which is an acronym for Environment Saskatchewan Quality Data, records all water, wastewater, surface water, and ground water data. All sampling results required to be submitted to the department by licensees are stored in this database. All information in the database is available on request, but is not otherwise shared with any parties or municipalities outside the department. Until the year 2000, even regional officers were required to phone in if they wished a search conducted for any particular data. In the year 2000, regional officers were placed on-line with direct access to this database but the same is still not available to the public. The second database is called WINDAT which stands for Works Information Data. This database is a repository for all information on water treatment plants and wastewater systems and is kept up to date as systems are upgraded or changed.

With the amalgamation of the Department of the Environment and the Department of Natural Resources effective April 1, 1993, a total reduction of 63 full time equivalent persons occurred. Also at this time, where the Department of Environment had previously been organized around land, air, and water, the environmental protection branch was reorganized along what is described as "client lines." This resulted in three branches in the environmental protection branch, identified as the commercial branch, industrial branch, and municipal branch. As a result of this reorganization, the eight regional environment officers, who until this time had been concerned only with water and wastewater, became part of the municipal branch. Additional duties were assigned to them, including inspection and compliance activities with respect to municipal solid waste systems (landfills), of which there were approximately 1,000 in the province, and also responsibility for liquid waste haulers, which consisted mostly of sewage transporters. As soon as this occurred, the regional environment officers were instructed to assign priority to the landfill program because, as stated by Mr. Ruggles:

> The Department up until that time had been unable to properly assess landfill systems across the province.
>
> There were no field staff available to do that, and so that was one of the – the drivers for asking our environment officers to initially dedicate more effort so they could – we could as a department, develop a better understanding of the – of the situation with landfills across the province.

The rationale for the assigning of these new duties was explained by Mr. Ruggles. He stated:

> And part of the rationale was that we were working with the same client, so typically they visit a municipal client they are able to talk all at once about wastewater, drinking water and waste management programs.

Mr. Ruggles was asked:

> Q And that was done with the knowledge that the number of inspections they could do to sewage works and waterworks would have to drop off substantially?
>
> A That's right.

In the fall of 1995, the Department of Finance retained a consulting firm to conduct a review of the entire department of SERM. This took place in the months of December, 1995, and January and February, 1996. Mr. Ruggles testified the review was intended to look at the structure and the organization of the department and to evaluate opportunities to reduce further expenditures through improved efficiencies across all programs. The result of this review and further work within the department was to establish environmental protection sections that would include industrial, commercial, and municipal responsibilities in each of the five EcoRegions that had been established in the province. The reorganization from the eight regions into five provincial EcoRegions started in 1996, and was completed in 1997. The Battlefords area falls within the Parkland EcoRegion that consists of 60,000-80,000 persons and 54 communities, the largest two of which are North Battleford and Lloydminster.

As a result of the reorganization of compliance activities into the five EcoRegions, and as a result of further budget reductions experienced by SERM in the 1996-97 fiscal year, the eight regional municipal branch officer positions devoted to water and wastewater ceased to exist. Two of these persons were lost to a mandatory retirement program, including the person who had acted as the municipal officer for the Battlefords area. The only enforcement officer remaining in the Battlefords area following this reorganization was Mr. Scott Meekma, whose background was in the mining and forestry industries. He was asked to take on water/wastewater responsibilities as well effective July, 1996. Mr. Meekma did not have any previous water or wastewater training. He took a four-day course on surface and ground water treatment in 1997, and another one in 1998, and has attended several workshops on water and wastewater since then. Up until September 2001, he was the only enforcement officer in the Parkland EcoRegion. His responsibilities included industrial, commercial, and municipal enforcement under 55 provincial statutes and 24 federal statutes.

In the fall, 1997, edition of *The Clear Water Reporter*, which was the final edition of a quarterly publication SERM had used as a communication medium to the water and wastewater industries, SERM advised the industry what the effect of its new model would be. The article reported:

> SERM has designed a new model placing greater emphasis on user responsibility, risk assessment, pollution prevention, and partnership approaches.
>
> ...
>
> What this means to a municipality is that it is ultimately responsible for how its staff operate the waterworks, waste waterworks, and waste disposal ground.

The article went on to say:

> The Department reviewed historical facility operational and sampling records to determine which municipalities might be at risk from drinking water contamination or pollution from the discharge of improperly treated wastewater effluent. This helped determine those which may require more time from a project supervisor (environment officer) to help them overcome their problems. Municipalities that were operating their utilities with little problems would not require the project supervisor to spend as much time with them allowing him to spend more time with others. However, the project supervisors would still be available' for technical assistance and compliance inspections, but due to their increased and more varied work load, they may not be immediately available for a site visit.

With the transfer of enforcement activity to the EcoRegions, the resource officers in the regions also became responsible for the licensing and permitting function, including for sewage and water treatment plants, that had formerly been done centrally in Regina in consultation with regional officers.

FINDINGS

44. The amalgamation of the Natural Resources Department with the Environment Department in 1993, created stresses within the new department on the priorities it should pursue. These stresses were exacerbated as the department continued to undergo budget reductions throughout the balance of the 1990s. Whatever power struggles or discussions went on within the department over budget, the end result was that the quality drinking water program was sacrificed as a matter of choice, not necessity. The choice was made knowing the result would be a reduction in the overall quality of drinking water in the province. The justification for those who made the choice was that s. 14 of *The Public Health Act, 1994* made municipalities responsible for producing potable water.

45. That the choice made by SERM to completely abandon its regulatory role in drinking water in the fall of 1999, did not completely come to pass was not due to any actions on its part, but rather to the opposition of the Department of Health and the Department of Municipal and Cultural Affairs.

(d) Inspection Program

From 1984 to 1991, the eight regional water and wastewater compliance officers had confined their activities to municipal waterworks only. In 1991, SERM decided it was necessary to have compliance inspections conducted on all licensed private and government works in addition to the municipal works that were being inspected. In a memo dated February 4, 1991, the manager of the municipal assessment and certification section reported to the regional environment officers:

> This will mean a reduction in the number of municipal inspections we can achieve each year. Over the past 3 years approximately 1,000 compliance inspections have been conducted each year in total. There will now be an additional 84 licensed private and government systems to inspect for a total of 1,126 'A-priority' works. This means that we can expect to achieve (1,000/1,126 =) 89% of our inspection work each year, based on an overall average.
>
> I therefore suggest ... that we establish a minimum inspection target of 85% to be done each year. The same priority system as we discussed at the recent WQB meeting would apply, i.e. any systems not inspected one year would go to the top of the list for next year's inspections.

The evidence establishes that the last surface water treatment plant inspection conducted by the regional officer for the North Battleford region prior to 2001 was in 1991. The present regional officer for the Battleford's area testified his understanding was that:

> It has been the Department's – if – if you consider the initial approach to large cities, it was – the inspection frequency was backed off, I believe in 1991, feeling that the larger cities had the certified operators and they had the resources to, you know, produce a – a potable water.

Through the year 1991, the water and wastewater compliance and assistance program was effective. In March, 1992, a client service survey was conducted of 333 municipal operators and administrators at various size communities in all areas of Saskatchewan to find out how the clients of the water quality branch perceived the quality of the programs and services they were receiving, and to determine if the branch was meeting its mandate from the client's perspective. The overall rate of return was 61%. The overall results indicated that 95.7% of survey respondents were satisfied or very satisfied with the quality of programs and services offered.

In the years 1993 and 1994, the regional officers devoted a considerable amount of time to landfill inspections in their new role as municipal compliance officers. In a quarterly report dated April 18, 1995, covering the period from January 1 to March 31, 1995, the supervisor of the eight municipal officers reported:

> Attached are the quarterly reports and graphs for the above mentioned period. As expected waterworks inspection activities led the way, as did waterworks complaints and inquiries. Sewage works inspection activities were normal for the quarter however, sewage works complaints and inquiries were higher than normal in a couple of regions. The reason for the high number of complaints and inquiries could be related to our reduction of inspection activities in the water and sewage works area.

In response, the acting director of the branch wrote a memo dated April 24, 1995, in which he stated:

> It is obvious from this quarterly report that our recent reduction in attention to waterworks has had a dramatic negative impact. Similarly, we can see a positive impact with WDGs. We expected this would happen, and because of our goals for the coming FY, the trend will most likely continue. (We plan to inspect 50%-W, 50%-SW; 100%-WDG).
> [emphasis added]

It will be observed from the foregoing that water and wastewater works inspections would be reduced by 50% while waste disposal grounds (WDG) would receive 100% inspection. This situation prevailed until 1997, when the reorganization of compliance activities into the EcoRegions was completed. This new model was what SERM witnesses referred to as a risk-based model. In essence, the municipal officers would no longer have routine contact with water and wastewater treatment systems. They would only become involved in the event a problem was identified through the bacteriological monitoring program in place, or upon special request. Mr. Meekma testified that from 1997 until the Walkerton outbreak in May, 2000, he spent 10%-30% of his time on water and wastewater combined.

A number of SERM witnesses attempted to justify the lack of an inspection program by SERM on the basis that one day of inspection per year would not guarantee safe water for the other 364 days. This argument belies the purpose of compliance inspections, which Mr. Meekma testified are carried out very vigorously in other industries in the province including the mining industry, forestry, and the oil industry. Mr. Meekma testified the enforcement policy with private industry was always more rigorous than it was with municipal governments because it was assumed private industry had the financial resources to implement best industry practices.

FINDINGS

46. The lack of inspection by SERM of the North Battleford surface water treatment plant for ten years prior to 2001 had a direct bearing on the events of April, 2001. Had regular inspections by knowledgeable personnel been carried out in this period of time, the deficiencies in the plant's processes and operating procedures identified following April, 2001, probably would have, and in any event should have, been identified and addressed prior to April, 2001.

(e) SERM's Knowledge of the Safety of Drinking Water

Throughout the reorganizations within SERM, and the resulting reduction in inspection and compliance activities related to water treatment plants, SERM was aware that many municipalities, and in particular the smaller municipalities, were in non-compliance with existing regulations and guidelines.

On June 13, 1994, the deputy minister of SERM wrote to the deputy minister of Health. The letter stated in part:

> Please find attached our report "Municipal Drinking Water Safety" which has been prepared with participation from SUMA, SARM, SWWA, Sask Water, Municipal government, PFRA, and your Department. Also attached for your information is an updated "issue note" on this subject.
>
> Safe drinking water is an important goal in this province. In January, 1991, Saskatchewan Health set an objective for 100 percent of the province's population to have access to safe and adequate drinking water by the year 2000. In March, 1991, Saskatchewan Environment and Resource Management released new objectives for Municipal Drinking Water Quality and announced that government would work with communities to ensure drinking water safety.
>
> We intend to use this report to show the extent of municipal drinking water safety problems in the province, particularly with small communities. ... In view of the potential for this report to be a very sensitive issue, we plan to prepare a Cabinet Decision Item (CDI) as well as briefing materials for Caucus. The CDI will address alternative approaches to communicate the report findings to stakeholders. A task group will be established to prepare the communications strategy for the CDI.

The "issue note" referred to in the first paragraph of the foregoing stated in part as follows:

> MUNICIPAL DRINKING WATER SAFETY ISSUE
>
> - Many municipalities in Saskatchewan supply water that does not meet our Municipal Drinking Water Quality Objectives.
>
> RESPONSE
>
> - Saskatchewan Environment and Resource Management has prepared a report which assesses municipal drinking water safety and recommends strategies to assist communities in solving problems.
>
> - The assessment of municipal drinking water systems indicates that:
>
>   (i) approximately 75% of the population is served by community supplies that met the Municipal Drinking Water Quality Objectives and had adequate treatment;
>
>   (ii) about 50% of the communities did not meet these objectives or lacked adequate water treatment and about 80% are communities with less than 500 people;
>
>   (iii) about 50% of the "problem" communities had adequate treatment in place so optimizing the performance of operations should be the solution; and
>
>   (iv) the estimated capital cost to upgrade water treatment plants ranges from $4.4 to $25.5 million depending on the type of technology used to solve the problems.
>
> - These results are based on an assessment of health

risk rather than whether a community's drinking water was absolutely safe or unsafe.

- Potential for immediate health hazards are responded to promptly by such actions as boil water advisories.

- The report will be used by government as a framework to implement the recommended strategies with the focus on "priority" communities.

- Concerns about small communities being able to afford costs to their water systems are considered in recommendations such as:

  (i) Saskatchewan Environment and Resource Management should provide additional technical assistance to optimize plant performance and allocate additional resources to on-site operator training; and

  (ii) Municipal Government should examine the need for a new conditional capital project targeting "problem" communities.

On April 28, 1995, the supervisor of the regional environment officers, in his report for the 1994-95 fiscal year ending March 31, 1995, concluded:

> This information can be used as a warning signal to our Department. A lack of surveillance at the waterworks facilities will very quickly lead to a deterioration in monitoring by the communities. The next item to deteriorate could be the proper operations of these facilities which could lead to a deterioration in drinking water quality throughout the province. It is imperative that we give drinking water quality a high priority. If we do not, drinking water quality problems will quickly increase to levels experienced prior to the staffing of the MEOs.

A drinking water compliance report for the period April 1, 1994, to March 31, 1995, but which is dated August, 1996, reinforced the Deputy Minister's observations made in June of 1994. This report stated that:

- approximately 50% of municipalities have drinking water quality problems. They do not meet the health-related objectives (77%), lack minimum water treatment (16%), or do not test their drinking water quality (7%).

- approximately 50% of the problem municipalities have operational difficulties which result in drinking water quality problems.

The report noted:

> Guidelines as Opposed to Standards:
>
> It is important to note that Saskatchewan does not have legislated drinking water quality standards. The province has deemed it unnecessary to establish drinking water standards, as this regulatory option is unlikely to improve drinking water quality. The province prefers to use a risk management approach to drinking water excursions.

The foregoing report was not circulated outside of SERM. In a memo dated May 2, 1997, from the deputy minister to the then Minister of Environment and Resource Management, the deputy minister stated "SERM does not intend to publicly release this report because of the detailed nature of the information (e.g. listings of communities which are out of compliance)."

The Saskatchewan Provincial Health Council issued its recommendations for the 1995-96 year to the provincial government in 1995. A number of these recommendations related to water quality issues. One such recommendation was:

> The provincial government develop a mechanism/authority to oversee all aspects of drinking water policy, research, management and funding for domestic, private and public drinking water supplies. This mechanism/authority must review water quality guidelines to provide the same level of protection for water as is now provided for food. The Departments of

> Environment and Resource Management (SERM) and Health and Sask Water should be represented as well as federal, provincial, regional, and municipal agencies and non-government organizations that have responsibility for health and drinking water quality.

The provincial government replied to the recommendations, including the foregoing, in January, 1997. It stated:

> The provincial government is currently developing an "Integrated Water Management Policy". Saskatchewan Health, Saskatchewan Environment and Resource Management, and Sask Water are participating in this project. Drinking water issues are included in the policy development.

Another recommendation made by the Council was:

> The Department of Municipal Government should ensure that necessary funding is provided to communities and by communities to construct and operate water utilities that begin with a set minimum standard for water quality protection and work toward national standards.

The government responded:

> Saskatchewan Municipal Government used to manage programs that provided funding to municipalities for water projects. Due to provincial budget constraints, this type of funding was discontinued in 1992-93.
>
> The Department of Municipal Government is considering a proposal for new funding for water and sewer improvements in the north. This initiative will be reviewed in the context of the overall provincial budget for 1997-98 and beyond.
>
> With the possibility of a second federal-provincial infrastructure program, one area of priority for funding would be water and sewer projects, especially in the north.

With respect to the foregoing recommendations the manager of the environmental protection branch water and wastewater program in the province wrote to the deputy minister of SERM on January 2, 1996, and made the following observations:

> I am concerned, however, about the absence of two SERM related issues which I believe are at least equally as important as those already identified by the SPHC for action. They are the identification, monitoring and response to drinking water microbiological problems, and the need for mandatory certification of water and wastewater system operators.
>
> Our data clearly indicate that many Saskatchewan municipalities are unable to consistently meet basic health and safety criteria for drinking water quality. In conjunction with this issue, there is also a need for improved monitoring of water-borne illnesses in Saskatchewan.
>
> The implementation of mandatory certification of water and wastewater system operators is also integral in the provision of safe drinking water and the prevention of environmental pollution.

On March 5, 1997, Mr. Richard Koroluk, the senior public health inspector for the Battlefords Health District, wrote to the manager of the Environmental Health Population Health Services of the Saskatchewan Department of Health to express the concern of the Battlefords Health District public health inspectors with respect to the way municipal water systems were being operated in smaller communities. The letter stated as follows:

> The Public Health Inspectors in the Battlefords Health District have some concerns in regard to the municipal water systems located in smaller communities. The communities would be ones that do not employ a full-time water treatment plant operator, or have operators that do not fully understand what they are doing and why they are doing it.
>
> The concern is that the way some of these smaller water treatment plants are operated will result in a major water-borne disease outbreak. In addition, it seems Saskatchewan

> Environment and Resource Management have abdicated their role in municipal water systems. The residents in these communities complain about the water quality to our department, not SERM. When we refer the complaints on to SERM, nothing is followed up, or they ask us to investigate. Attached, as an example, is a water complaint investigation on the Village of Makwa's water system done by the Public Health Inspector located in Meadow Lake. She contacted several individuals in SERM and could not find anyone to respond.
>
> Could Sask. Health contact Saskatchewan Environment and Resource Management to have them:
>
> - Clarify their role and involvement in municipal water systems (Do they still inspect water plants).
> - Provide a list of Environment officers to whom complaints can be referred to and the area in the Province they are responsible for.
>
> Thank you for your co-operation in this matter.

Mr. Kololuk testified that as a result of the structural changes introduced by SERM in 1996, which included the retirement of the local SERM representative responsible for water quality, the health district had "sort of lost contact with SERM representatives at about that point."

Mr. Koroluk stated the letter was generated by a number of complaints from smaller communities. A particular concern was the fact that many of these smaller municipalities did not have dedicated water treatment personnel. He testified:

> [The] concern we had was that a lot of these municipalities, villages and hamlets didn't have what you call dedicated water treatment personnel, you know, the person running the water plant was either on contract or he was the garbage man who was given additional responsibilities for looking after a plant or he was some relative of the elected officials so they were looking after the plant and they didn't have any really water background and experience, didn't have any knowledge with regards to chemical application and so on and so forth.

Mr. Koroluk received a reply stating his letter was being forwarded to the person in charge of standards at the environmental protection branch of SERM. Mr. Koroluk did not receive any further communication with respect to this memo.

On April 10, 1997, Mr. Koroluk wrote a letter directly to the person in charge of standards at SERM. The letter stated:

> Attached is a copy of a memo from a member of my inspectorate staff concerning a complaint from a resident about the Village of Paynton's Water Supply.
>
> As you may be aware the health districts have been receiving a number of these types of complaints, which may be attributed to water treatment plant operator error.
>
> SERM is the licensing authority for municipal water systems. Is there a minimum criteria that municipalities must follow when securing the services of a water treatment plant operator so that the public's health is not compromised by the improper addition of chemicals?
>
> The above is for your information and/or action.

He received a reply dated April 16, 1997, indicating his memo had been forwarded to the environmental manager for the Parklands EcoRegion for a response "to your questions about municipal drinking water quality program delivery in the Battlefords Health District." He did not receive any further reply.

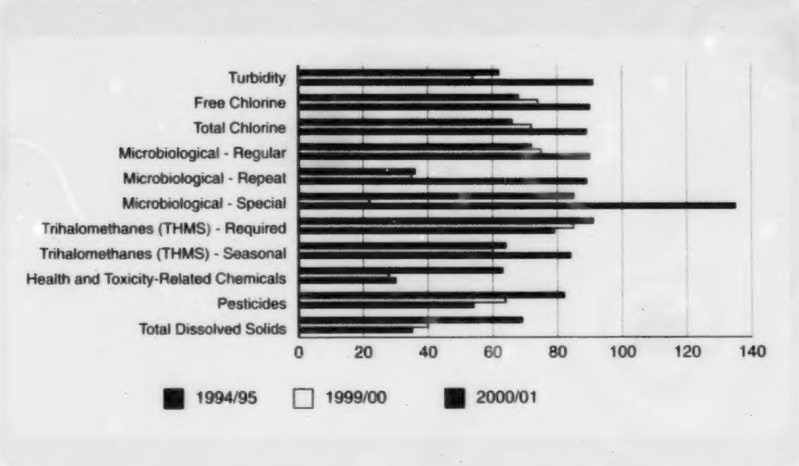
From approximately 1995 onward, SERM was working towards developing a mandatory operator certification program in the province. SERM was aware that its withdrawal from compliance activities would have adverse consequences for safe drinking water, and regarded mandatory certification of operators as a means to ensure some competence in water and wastewater treatment at the local level. In February, 1999, the provincial cabinet directed SERM to make the certification mandatory. This program will be dealt with separately hereafter.

In November, 2000, SERM published a compliance report on water treatment in the province for the period from April 1, 1999, to March 31, 2000.

In September 2001, SERM produced a compliance report for the period April 1, 2000, to March 31, 2001. The following chart reflects certain of the findings made in the 1994-95 compliance report referred to, (see above) and the foregoing two reports:

Fig. 14

SASKATCHEWAN ENVIRONMENT AND RESOURCE MANAGEMENT DRINKING WATER COMPLIANCE REPORT SUMMARY: COMPLIANCE WITH SAMPLE REQUIREMENTS 1994/95, 1999/00, 2000/01



Source: Saskatchewan Environment and Resource Management
Drinking Water Compliance Report Summaries
1994/95, 1999/00, 2000/01
Compiled by North Battleford Water Inquiry

Fig. 15
SASKATCHEWAN ENVIRONMENT AND RESOURCE MANAGEMENT DRINKING WATER COMPLIANCE REPORT SUMMARY: TURBIDITY, FREE CHLORINE, TOTAL CHLORINE, MICROBIOLOGICAL (REGULAR SAMPLES)
1994/95, 1999/00, 2000/01

	1994/95	1999/00	2000/01
Turbidity			
- Percentage of reporting facilties in compliance with objective of 1 NTU	62% of 82% reporting	54% of 80% reporting	91% of 79% reporting
Free Chlorine			
- Percentage of reporting facilities in compliance with free chlorine residuals required by regulation	47% of 68% reporting	56% of 74% reporting	85% of 90% reporting
Total Chlorine			
- Percentage of reporting facilities in compliance with total chlorine residuals required by regulation	29% of 66% reporting	24% of 72% reporting	73% of 89% reporting
Microbiological (Regular Samples)			
- Percentage of reporting facilities that met bacteriological objectives	37% of 72% reporting	42% of 75% reporting	32% of 90% reporting

Source: Saskatchewan Environment and Resource Management
Drinking Water Compliance Report Summaries
1994/95, 1999/00, 2000/01
Compiled by North Battleford Water Inquiry

FINDINGS

47. SERM was aware that its withdrawal from compliance activities would have adverse consequences for safe drinking water, and regarded mandatory certification of operators as a means to ensure some competence in water and wastewater treatment at the local level.

(f) Cabinet Decision Item (CDI)

The outbreak of *E. coli* in Walkerton, Ontario caught the attention of regulators in the Province of Saskatchewan, as it no doubt did elsewhere, and also caught the attention of ministers of the government whose departments had an interest in public health and safety. On June 9, 2000, the Ministers of Health and SERM addressed a Cabinet Information Item to the Premier and to all cabinet ministers. The issue was identified as:

> Improving the safety of drinking water supplies in Saskatchewan.

Under the heading of "Issues" in the document, the following was stated:

> ISSUES:
>
> At present there are procedures and protocols in place to protect drinking water supplies. However, there are a number of areas where improvements could be made as noted below:
>
> - More than 75% of municipalities do not submit 100% of the required bacteriological samples, 44 communities did not submit any samples to date in 2000 and 29 did not submit in 1999 (Action #4);
> - Only about 45% of the required additional follow-up samples this year (up to May 15, 2000) were submitted and 46% were submitted in 1999 (Action #4);
> - Transit time for shipping samples to the lab is excessive in some cases, particularly in northern Saskatchewan (Planned #4);
> - 14 communities reliant on ground water do not have minimum treatment that includes continuous disinfection (Action #4);
> - 19 communities reliant on surface water do not have the absolute minimum treatment requirement of

coagulation, filtration and disinfection (Action #4). In addition many more do not have taste and odour control such as granular activated carbon, powdered activated carbon or other means;

- In the past (1995-96), concerns about drinking water quality monitoring in northern Saskatchewan have arisen based on bacteriological problems (Actions #1, 2, 3, 4, 7, 14). A more exhaustive description of specific issues related to drinking water quality in northern Saskatchewan which was developed previously is attached separately as Appendix 2;

- The province's water lab is not able to conduct a quantitative analysis of *E. coli* (Action #3), and furthermore the present follow-up protocol does not require *E. coli* testing. However, tests for fecal coliforms are used as a substitute (Planned #4);

- Some water treatment plants are not properly operated or properly optimized (Action #4);

- Many waterworks in small communities have surpassed their original design lives and it is expensive to upgrade the infrastructure such as water treatment and distribution works (Planned #12);

- Only 25% of waterworks operators participated in the voluntary operator certification programs (Action #6);

- In some cases, the existing follow-up procedure may not be timely enough because too much time would have lapsed before the required boil water advisory is issued (Action #1);

- The Municipal Drinking Water Quality Objectives do not mention *E. coli*. Therefore there may be pressure to revise these objectives, although using total coliform and fecal coliform to indicate the safety of drinking water is more conservative than just using *E. coli* alone (Considered #12);

- SERM has not conducted a comprehensive drinking water compliance report since 1995 (Action #7);
- Communications between SERM staff and the health districts or the local medical health officers have been limited (Action #1, Planned #7);
- The current provincial protocol (developed by Saskatchewan Health and health districts) for responding to disease outbreaks does not clearly identify agency roles for water-borne diseases (Planned #12);
- Over reaction of some communities by increasing the dosage of disinfectant such as chlorine could increase the concentration of undesirable disinfection by-products such as trihalomethanes (Planned #6). Epidemiology studies have been published which reported associations between THMs in drinking water and cancer and possibly adverse pregnancy outcomes; and
- There are private water systems that are not sampled or treated properly. Health related parameters such as the microbial, chemical, radiological, and metal toxicity may benefit from further review and assessment.

ACTION:

Saskatchewan Environment and Resource Management and Saskatchewan Health have reexamined the present bacteriological quality monitoring and compliance framework and are taking immediate actions to reinforce a number of critical areas in the short term which are vital to ensure safe water supplies. Issues of a more long term and preventative nature as well as other aspects of drinking water quality are also addressed.

In general terms, the actions cited below address four components of a management framework for protecting

4

> drinking water supplies: Actions to enhance detection of problems or potential problems, actions to resolve potential or real problems once detected, actions to prevent water contamination issues, and actions to improve communications with municipalities, other departments and the public. All four components must be fully addressed to ensure long term safety of drinking water supplies. Those items marked with an asterisk (*) will be subject to further consideration (within a planned CDI).
>
> The immediate action items identified were:
>
> 1. Enhanced follow up of positive bacteriological results;
> 2. Identify communities and systems which pose a risk to public safety;
> 3. Improved sample analysis and advisory notification;
> 4. Improved communication procedures for communities and private systems;
> 5. Data gap analysis; and
> 6. Operator certification regulations.

Over the next several months a detailed Cabinet Decision Item was prepared and was signed by the Ministers of Health, Environment, and the Minister responsible for the Saskatchewan Water Corporation on November 20, 2000. The document is reasonably comprehensive in assessing the state of water treatment and the problem areas in the province. The document states:

> Approximately 650,000 residents of larger cities, towns and Sask Water operated regional utilities have sophisticated, reliable treatment systems and no operational problems and are at low risk of having water-borne disease concerns. However, because of the large population involved, an incident could have major consequences and thus the management of the risk becomes a primary concern.

Approximately 200,000 citizens are at moderate risk as they reside in areas with minimal or unreliable water treatment systems and where insufficient or no samples for bacteriological analysis are submitted. Different and varying strategies to manage the risk need to be employed at these locations due to their inherent wide range of problems and issues. The population served at individual locations, however, are smaller in number and, therefore, an incident would have a moderate level of impact.

There are approximately 150,000 residents (such as farmers, cottage owners, etc) of Saskatchewan that rely on private water systems. Water sources for these systems are ground water (wells) or surface water (small reservoirs also known as dugouts). The raw water quality from these water systems varies and in some cases may have complex treatment requirements. Many of these systems are not sampled or treated properly. The risk to individuals consuming water from these sources can be high due to the lack of resources and knowledge of the water system owner/operator. Due to the limited number of individuals served by one of these smaller public systems, the overall magnitude of a disease outbreak would be small.

Sask Water reports that there are 70,000 wells recorded as constructed in the province. There is no information as to how many of these constructed wells are active. In addition, there is no accurate figure for the number of small reservoirs existing in the province.

It is estimated that there are approximately 1,500 small public water communal systems throughout the province which fall under the jurisdiction of Saskatchewan Health and health districts. These systems range in type from those that are water tank loading facilities in rural areas to those that supply water for roadside restaurants, motels, campgrounds etc. Many of these water systems are not adequately sampled and some may not be adequately treated.

The following table appears in the CDI and outlines the population range of the communities, the total number of works within those communities, and whether they are ground waterworks or surface waterworks.

Fig. 16
COMMUNITY WATERWORKS

Population Range	Total Works	Groundwater Works	Surface Waterworks
0 - 100	161	119	42
101 - 500	229	177	52
501 - 1000	71	58	13
1001 - 2500	43	26	17
2501 - 5000	13	6	7
5001 - 25000	7	1	6
> 25000	4	0	4
TOTAL	**528***	**387**	**141**

* Excluding large public and government works

Source: Government of Saskatchewan
Cabinet Decision Item
November 20, 2000
Exhibit C-43 Tab B19

The CDI correctly notes:

> The risk of consuming contaminated water for Saskatchewan's million citizens varies with the level of treatment, the population that is exposed, the condition of the infrastructure, the raw water source, operational expertise, and the frequency of monitoring.

The document also notes:

> The management of the province's municipal drinking water program has changed significantly in the past five years, due to budgetary constraints and the reorganization of SERM.

In the CDI, under the heading "Problem Statement and Summary of Key Issues" the following text appears:

> In the aftermath of events in Walkerton, Ontario, an assessment of the quality of water supply systems and the related monitoring and protection activities in Saskatchewan

was conducted. Although some heightened drinking water monitoring and response activities have been implemented since June 2000, five key problems remain in Saskatchewan's drinking water quality system that pose a high to very high safety risk and threaten the security of population health. Figure 2 at the end of the detailed analyses references the problem facets and the government response.

First, there are high rates of non-compliance by communities and owners of drinking water systems with the current legislation. This contributes significant risk to the water supply. During the 1999-2000 fiscal year, 57 percent of the municipalities or owners submitted less than 80 percent of the bacteriological samples required by their license. Of even greater concern than frequency of testing is that only 42 percent of licensed facilities met the bacteriological objectives of "no detection."

Second, Saskatchewan has a high number of deficient and aging water treatment systems which are incapable of producing safe drinking water. One hundred and twenty-one Saskatchewan communities have drinking water treatment deficiencies, including 33 which do not have minimum water treatment capabilities, such as disinfection. Some small municipalities do not have the capacity to fund a major treatment and/or distribution system upgrade, or insufficient tax base to do so.

Third, many operators of water treatment and distribution systems are inadequately trained and there is limited access to resources pertaining to operation of water treatment plants and processes. Failure to understand or properly conduct water treatment processes can be linked to the outbreak of water-borne disease.

Fourth, many individuals that operate their own water treatment systems have limited knowledge regarding water treatment processes and requirements as well as limited access to information and related resources. Due to this lack of knowledge, many private systems are improperly sited,

> constructed, treated and inadequately sampled. The results of well testing conducted by Sask Water show that 35 percent of more than 700 wells did not meet health objectives for bacteria and nitrates. Approximately 10 percent of the wells have arsenic concentrations that exceed drinking water objectives. The health of individuals who consume the water from these systems can be at great risk, however the number of people potentially affected is small.
>
> Fifth, the general public is poorly informed while also lacking resources and ready access to water quality information to make informed decisions on drinking water safety issues. Currently, the lack of a complete educational program plays a role in the increased risk to consuming unsafe drinking water. Limited education and information material reduces the options that residents and owners have in resolving drinking water issues. The public is demanding to be more informed on issues that involve them. Requests for data can be made though SERM but there is no automated or readily accessible means for the public, researchers, consultants and external departments to directly access municipal drinking water quality data so they can make their own decisions.
>
> A related issue is the public perception that contamination resulting from intensive livestock operations (ILOs) pose the largest threat to drinking water supplies. In reality, however, ILOs probably represent the smallest threat to drinking water because they have been scrutinized for their potential risks and their design incorporates the most current approaches to handling animal waste. However, some risk likely lies with the thousands of unregulated livestock units that do not require permits to operate.

It will be noted the foregoing document admits knowledge of a high to very high risk to the security of population health if the problems identified in the document are not addressed. The document recommends against the status quo and points out that the disadvantages of the status quo as follows:

- Represents little or no involvement in water systems.

- The risks associated with municipal, public, and private systems will remain high, infrastructure deterioration will continue and lead to further increased risk to public health.

- Does not provide for a pro-active approach to protecting drinking water in the province and issues are dealt with on an emergency basis with inconsistent follow-up from both SERM and Health perspectives, contrary to public expectation and the mandated government role.

- Insufficient resources to identify and respond to issues like bacteriological contamination in a timely manner.

- Regulations or policies for addressing the operation of public water supplies that are not regulated by SERM (e.g. Rural Municipal wells not connected to a distribution system; campgrounds; rural roadside motels/restaurants, etc.) will remain inadequate.

- For SERM regulated systems, there will be increased demands on public health inspectors and SERM staff with respect to water issues that will diminish their capacity to deal with other public health and environmental issues. Subsequently SERM, health districts and government will be criticized for not taking any action to address water quality issues.

Attached as Appendix "G" is a table from the CDI which summarizes the problems identified and the strategic drinking water program proposed, along with anticipated additional funding requirements to implement the program.

The document indicated that long term strategies to further reduce the risks involving water supplies would be provided in the form of another CDI to be brought forward by June, 2001. The purpose of this additional CDI was to update Cabinet on progress, address issues such as existing infrastructure assessment/improvement needs, fee for service waterworks, technical assistance needs, and the promotion of regional water utilities, etc. The *Cryptosporidium parvum* outbreak in North Battleford in March/April, 2001, and the subsequent establishment of this inquiry, resulted in the government postponing any further CDI pending the conclusion of this inquiry.

As will be noted from the summary of the drinking water program outlined in the CDI, responsibility for implementing the program rests with two different government departments, SERM and Health, and a Crown corporation, the Saskatchewan Water Corporation. All three parties responsible for implementing the CDI or recommended enhancements to the program in the future have separate budgets. No one is in charge of the program. Professor Marie-Ann Bowden, an environmental law professor who testified at the inquiry, referred to the regulatory framework dealing with water quality in the province as one of "everybody but nobody." The problem of regulatory responsibility was recognized by the president of the Saskatchewan Water Corporation in a memorandum he wrote to the participants formulating the CDI dated August 10, 2000. It stated:

> Regulatory Responsibility
>
> We believe that cost-effective management of drinking water quality requires clear lines of responsibility. Over the decades, program changes and numerous agency structural changes have resulted in a division of responsibilities for drinking water quality that is ineffective and inefficient in our judgement. We consider this situation of sufficient concern to bring it to Cabinet's attention in the CDI.
>
> SERM is responsible for both water treatment and sewer treatment. So is Health. The basis for division is the volume production of the plant. There does not appear to be a practical justification for this division that would be consistent with a desire to offer the public the most effective response to the issue.
>
> We wish to see one department responsible for drinking water regulation and monitoring. Arguments can be made for it to be either Health or SERM. On balance the most persuasive argument is probably for SERM to be the regulatory agency. While drinking water quality has nothing to do with environmental stewardship, it does match nicely with responsibility for regulation and monitoring of sewage treatment plants which clearly does fit the SERM mandate.

> As a first step in the process of streamlining, it is recommended that there be no artificial division of responsibilities between Health and SERM with respect to approval of treatment plants and SERM deal with all treatment systems including those currently administered by Health. Sask Water, or a private consultant, would respond on all operational issues where treatment plant troubleshooting, operational problems, etc. exist.
>
> The streamlining should improve efficiencies and the effectiveness of programs through consolidation of expertise and program scope. It should minimize the potential for duplication of expertise, redundancy of effort and public confusion over agency roles and responsibilities.

The executive director of the community support services branch of the Department of Municipal Affairs, Culture and Housing, in a memorandum dated August 28, 2000, to an interdepartmental committee emphasized that municipalities and their responsibility for water quality was not being considered in the action plan proposed. He wrote:

> 1. The CDI needs to clearly set out the existing roles and responsibilities of the various actors in Saskatchewan's current drinking water management system. Responsibility for safe drinking water is shared between the province, municipalities, and the operators of private water systems. The federal government is also involved in communities under federal jurisdiction. The role of municipalities in the drinking water system should not be understated. Municipalities are responsible under *The Public Health Act, 1994* to provide a source of potable water. In addition to supplying drinking water, municipalities also play an important role in regulating the use and development of land under *The Planning and Development Act, 1983* to protect ground water and surface water sources from contamination.
>
> ...

4. Given the significant role that municipalities play in the drinking water system a provincial strategy to improve the safety of drinking water must involve the municipalities and should be developed in consultation with the municipal sector. To ensure acceptability the public should also be included in this process.

SERM's recommended components of the program as set out and explained in the CDI are:

- Implement a monitoring and compliance program to conduct inspections on municipal/public water facilities and thereby ensure a comprehensive water quality control program at all facilities.
- Continue to implement the revised bacteriological response protocol to advise owners/operators of positive bacterial results and coordinate follow up procedures.
- Develop an integrated provincial water quality database that captures water quality information for all municipal public and private water supplies. The database will be an important tool for researchers to ensure safer drinking water through water quality surveillance and trend analysis and in assessing impacts of activities such as industry, pesticide usage, sewage disposal, and livestock operations. In addition, the database will address the provincial laboratory needs to manage water samples, electronic transmission of data, and report generation.
- Providing web-enabled accessibility to municipal water quality information.
- Implement a two phase activity plan outlined in the communications strategy that employs educational and training components.

Saskatchewan Health/Health District recommended components are:

- Reduce turnaround time, incorporating routine *E. coli* testing, and improving reporting mechanisms of the Provincial Lab to handle a greater volume of specimens submitted for bacteriological testing and permit enhanced response to unacceptable bacteriological results (positive coliforms, bacterial overgrowth).

- Ensure that analytical methods and QA/QC protocols employed by the Provincial Laboratory's Environmental Sciences Section meet nationally recognized standards by attaining accreditation.

- Improve monitoring and ensure appropriate remedial action for the estimated 1500 public water systems that are not already regulated by SERM.

- Develop private water system programs to educate owner/operators of private water systems (e.g. farmers, acreage owners, etc.) of the need to sample and properly maintain and treat their water systems. This item will be coordinated with Sask Water.

- Extension of SERM's element B.1.3 for the Provincial Health Laboratory to coordinate data management services.

Saskatchewan Water Corporation recommended components are:

B.3.1 The following Sask Water elements are combined under the following implementation item:

- Target infrastructure funding to high risk water treatment and distribution systems through cost sharing grants. Coordination of the funding program will be through MACH with support from Sask Water and SERM. This funding will begin in the 2001-2002 budget and continue for 6 years.

- Evaluate at a conceptual level the current state of infrastructure for all municipalities and public systems to determine upgrade requirements to meet safe drinking water objectives. Sask Water will provide leadership and report back to the government by June, 2001.

- Conduct risk assessment evaluations to determine optimum long term management strategies for existing facilities to minimize infrastructure spending where deemed acceptable.

- Promote regional water utilities and evaluate possible candidates based on infrastructure funding availability.

- Mandate a multi-stakeholder public involvement process to develop fairness in user pay and cost recovery initiatives to reduce the long term and ongoing burden of senior government infrastructure funding requirements.

- A coordinated municipal, public, and private technical assistance service through Sask Water will be developed to make recommendations on treatment, process and maintenance issues.

- Mandate Sask Water, in collaboration with SERM and Health, to conduct a multi-stakeholder involvement process to efficiently streamline roles and clarify importance and responsibilities of the provincial government and owners of municipal and public water systems as they relate to public safety, design, treatment, operation, performance monitoring, and systems maintenance: and, to determine the conditions under which user pay and cost recovery initiatives will be implemented.

General government recommended components are:

B.4 The following government elements are combined under the following implementation item:

- Through Sask Health discuss and determine with SERM and other stakeholders any necessary enhancements needed for the provincial laboratory to test for microbiological and chemical parameters such as pathogenic bacteria, protozoans, trace metals, pesticides, and disinfection by-products.
- Through Sask Health recommend resource requirements identified by health districts to fully implement monitoring programs for public water systems that are not regulated by SERM.

Under the heading of "Provincial Implications" the CDI noted:

> Clean water is SERM's goal and a pro-active approach is SERM's preferred method of resolving the environmental and public health issues. Ensuring safe and palatable drinking water should translate to significant public health benefits (especially children and senior citizens). A healthier public means fewer demands on the health system and less cost to the province. Although no figures have been released, the costs associated with the outbreak of illness in Walkerton far outweighed the costs of providing appropriate treatment and monitoring of the town's waterworks.

Under the heading "Political Implications" the document noted:

> This strategy will provide the government with the tools to ensure that the legislative responsibility to protect the quality of drinking water is met. The government will also have the tools to provide a quick response to drinking water quality issues as they arise.

No additional funding was allocated for implementation of the recommendations in the CDI until the 2001-02 fiscal year.

FINDINGS

48. That the responsibility for implementing the CDI rests with three or more entities, with separate budgets, and separate priorities, is considered a serious weakness in the implementation strategy.

49. The CDI does not identify what its monitoring and compliance program will consist of to conduct inspections on municipal/public water facilities. To the extent the monitoring and compliance program is intended to "ensure a comprehensive water quality program at all facilities," the financial resources committed to the program to date will not accomplish this.

(g) Bacteriological Response Protocol

Also in June, 2000, SERM and the Department of Health drafted a bacteriological response protocol. Its purpose was to establish what should be done and by whom whenever a lab result on a sample produced a positive bacteriological result, which was defined as:

(i) 1 or more total coliforms (TC);
(ii) 1 or more fecal coliforms (FC);
(iii) Overgrowth (OG); or
(iv) Greater than 200 colonies of background bacteria

(in a 100 millilitre sample).

The provincial laboratory receives all water samples to be tested for bacteria required to be submitted by municipalities in their permit to operate a water treatment plant. The samples are usually submitted by courier to the laboratory. If they are received in the afternoon they likely will not be tested until the following day, unless an urgent request accompanied the sample. The report of the test will be available the same day the test is performed with respect to total coliforms. If the test is positive for total coliforms, an *E. coli* test is then performed on the sample, the results of which are available 24 hours later.

The environmental protection branch (EPB) of SERM in Regina sends a representative to collect all bacteriological samples daily and sometimes twice a day. SERM personnel enter the results into a database, and implement the follow up procedure outlined in the protocol whenever positive results are noted.

The follow up protocol provides that EPB will notify the EcoRegion in which the community producing the positive sample is located by phone and by e-mail forthwith. In addition, EPB is to e-mail the senior public health inspector for the local health district.

The protocol provides that the EPB representative in the EcoRegion who receives a positive bacteria report immediately contact the water treatment plant to determine if there are any known problems with the plant or the water distribution system, and request a repeat sample forthwith. Unless there is a problem with the plant, the health district is not required to take any action until the result of the repeat sample is known. If there is an identified problem with the water treatment process or the water distribution system that could account for the original sample result, or the repeat sample result, the health district is to forthwith investigate whether there is an abnormal number of illnesses in the community that could be related to drinking water. If the repeat sample is also positive, then a number of actions are called for, including the submission of three more special samples. The following chart summarizes the steps to be taken by EPB, the EcoRegion, Saskatchewan Health, the provincial laboratory, and the health districts in each situation:

Fig. 17a
SUMMARY OF ACTIONS TO BE TAKEN BY ENVIRONMENTAL PROTECTION BRANCH, ECOREGION, SASK HEALTH / PROVINCIAL LABORATORY AND HEALTH DISTRICTS

Legend:
EBWO - Emergency Boil Water Order
FC - Faecal Coliform
PDWA - Precautionary Drinking Water Advisory
TC - Total Coliform

Samples	***Results***	***Environmental Protection Branch (EPB)***	***Eco Region (ER)***	***Health District (HD)***	***ProvincialLab***
Routine Sample Submission		No Action	No Action	No Action	Perform TC Analysis
Routine	Positive TC or background/over-growth	Phone results to ER. Email results to ER cc HD. Enter data	Receive results as information. Contact municipality. Obtain water system and sampling information from municipality and request repeat samples be submitted. Review historical water quality data and treatment process for the specific municipality.	Receive results as information. No follow-up action required.	Perform *E. Coli* Test on positive TC Plate
Routine	Positive *E. Coli*	Phone results to ER. Email results to ER cc HD. Enter data	Contact HD discuss possible issuance of EBWO. If EBWO is issued contact municipality to arrange a meeting with HD and ER. If EBWO issued advise EPB.	Discuss ER's request for the issuance of an EBWO. If issued phone order to municipality and follow-up with letter. Advise Sask Health of issuance of order. If issued attend meeting with ER and municipality.	Provide Results to EPB
Routine	Negative TC or background/over-growth	Enter data	No Action	No Action	Provide Results to EPB
Routine	Negative *E. Coli*	Email results to ER and HD. Enter data	No Action. But continue with monitoring the repeat sample.	No Action	Provide Results to EPB
Repeat Sample Submission		No Action	No Action	No Action	Perform TC & FC analysis and *E. Coli* Test on any positive

Fig. 17b
SUMMARY OF ACTIONS TO BE TAKEN BY ENVIRONMENTAL PROTECTION BRANCH, ECOREGION, SASK HEALTH / PROVINCIAL LABORATORY AND HEALTH DISTRICTS

Legend:

EBWO - Emergency Boil Water Order
FC - Faecal Coliform
PDWA - Precautionary Drinking Water Advisory
TC - Total Coliform

Samples	***Results***	***Environmental ProtectionBranch (EPB)***	***Eco Region (ER)***	***Health District (HD)***	***ProvincialLab***
Repeat	Positive FC	Phone results to ER. Email results to ER cc HD. Enter data	Contact HD request issuance of EBWO. Contact Municipality and obtain progress on remedial action. Request special samples. Contact municipality to arrange a meeting with HD and ER. Advise EPB of issuance.	Discuss ER's request for a EBWO. If issued phone order to municipality and follow-up with letter. Advise Sask Health of issuance of order. Attend meeting with ER and municipality.	Provide results to EPB Perform *E. Coli* test
Repeat	**Positive TC or background/overgrowth**	**Phone results to ER. Email results to ER cc HD. Enter data**	**Contact HD to discuss the issuance of PDWA, if PDWA has not been issued. If PDWA is issued, arrange a meeting with municipality; & advise EPB. Contact municipality and obtain progress report on remedial actions. Request special samples.**	**Discuss with ER regarding the issuance of a PDWA.**	**Provide results to EPB Perform *E. Coli* test**
Repeat	Positive *E. Coli*	Phone results to ER. Email results to ER cc HD. Enter data	If EBWO not already issued request HD to issue. Advise EPB of issuance. Contact municipality to review progress on remedial action and provide direction on any further corrections. If not already addressed request meeting with municipality and HD.	Phone order to municipality and follow-up with letter. Advise Sask Health of issuance of order. Attend meeting with ER and municipality.	
Repeat	**Negative TC & FC or background/overgrowth**	**Email results to ER cc HD. Enter data**	**If EBWO or PDWA was issued, continue to monitor the community's progress and consult with HD. If no EBWO or PDWA was issued not further action required.**	**If EBWO or PDWA was issued, continue to monitor the community's progress and consult with ER. If no EBWO or PDWA was issued no further action required.**	**Provide results to EPB**

Fig. 17c
SUMMARY OF ACTIONS TO BE TAKEN BY ENVIRONMENTAL PROTECTION BRANCH, ECOREGION, SASK HEALTH / PROVINCIAL LABORATORY AND HEALTH DISTRICTS

Legend:

EBWO - Emergency Boil Water Order
FC - Faecal Coliform
PDWA - Precautionary Drinking Water Advisory
TC - Total Coliform

Samples	***Results***	***Environmental Protection Branch (EPB)***	***Eco Region (ER)***	***Health District (HD)***	***ProvincialLab***
Repeat	Negative *E. Coli*	Email results to ER and HD. Enter data	If EBWO or PDWA was issued, continue to monitor the community's progress and consult with HD. If no EBWO or PDWA was issued, wait for special sample results for further actions. If no EBWO or PDWA, wait for special samples test results for further actions.	If EBWO or PDWA was issued, continue to monitor the community's progress and consult with ER. If no EBWO or PDWA, wait for special samples test results for further actions.	
Special Sample Submission		No Action	No Action	No Action	Perform TC and FC on each sample and perform an *E. Coli* test on any positive.
Any Special Sample	Any Positive Results	Phone results to ER. Email results to ER cc HD. Enter data	If an EBWO or a PDWA outstanding, advise municipality to collect at least 2 (two) sets of 3 "special" samples and more tests of the distribution system. If EBWO or PDWA not issued yet, consult with HD regarding issuance.	Consult with ER	Provide results to EPB and perform *E. Coli* Test
Special Sample taken at same sampling location as routine sample	Positive FC	Phone results to ER. Email results to ER cc HD. Enter data	If not part of the distribution system no action. If a portion of distribution system, have municipality isolate problem and perform remedial action.	HD, or other authority having plumbing inspection jurisdiction, will investigate possible cross connection at the building where the sample was taken. HD may issue a EBWO for the specific building. Advise Sask Heath if issued. Inform ER of actions.	Provide results to EPB and perform *E. Coli* Test

Fig. 17d
SUMMARY OF ACTIONS TO BE TAKEN BY ENVIRONMENTAL PROTECTION BRANCH, ECOREGION, SASK HEALTH / PROVINCIAL LABORATORY AND HEALTH DISTRICTS

Legend:

EBWO - Emergency Boil Water Order
FC - Faecal Coliform

PDWA - Precautionary Drinking Water Advisory
TC - Total Coliform

Samples	***Results***	***Environmental Protection Branch (EPB)***	***Eco Region (ER)***	***Health District (HD)***	***ProvincialLab***
Special Sample (upstream and downstream)	Positive FC	Phone results to ER. Email results to ER cc HD. Enter data	Contact HD to request issuance of EBWO (If not already issued). Advise EPB of any issuance. Contact Municipality to review progress on remedial action and provide direction on any further corrections. If EBWO has just been issued request meeting with municipality and HD. Advise municipality to collect 2 sets of samples.	If not already in effect discuss ER's request for an EBWO. If EBWO is issued, phone order to municipality and follow-up with letter. Advise Sask Health of issuance. Attend meeting with ER and municipality.	Provide results to EPB and perform *E. Coli* Test
Any or all Special Samples	Positive TC, OG, >200 Background	Phone results to ER. Email results to ER cc HD. Enter data	If no EBWO or PDWA, discuss with HD regarding issuance of PDWA. If PDWA, arrange meeting with municipality. Advise municipality to collect 2 sets of samples. Advise EPB.	If no EBWO or PDWA, discuss ER's request for an issuance of PDWA.	Provide results to EPB and perform *E. Coli* Test
Special Samples	Positive *E. Coli*	Phone results to ER. Email results to ER cc HD. Enter data	Contact HD and if EBWO or PDWA not in effect request issuance. Advise EPB of issuance. Contact municipality review progress report and provide any further direction. If EBWO was just issued request meeting with municipality and HD. Advise municipality to collect 2 sets of samples. Advise EPB.	If EBWO or PDWA not already issued discuss ER's request for an issuance of one. If EBWO is issued, phone order to municipality and follow-up with letter. Advise Sask Health of issuance. Attend meeting with ER and municipality.	Provide *E. Coli* results to EPB

Fig. 17e
SUMMARY OF ACTIONS TO BE TAKEN BY ENVIRONMENTAL PROTECTION BRANCH, ECOREGION, SASK HEALTH / PROVINCIAL LABORATORY AND HEALTH DISTRICTS

Legend: EBWO - Emergency Boil Water Order
FC - Faecal Coliform
PDWA - Precautionary Drinking Water Advisory
TC - Total Coliform

Samples	***Results***	***Environmental Protection Branch (EPB)***	***Eco Region (ER)***	***Health District (HD)***	***ProvincialLab***
Special Samples (upstream downstream and location where initial routine was taken)	Negative TC, FC, OG, < 200 BG and *E. Coli*	Email results to ER and HD. Enter data	Contact HD is EBWO or PDWA is in effect to discuss progress or remedial works and rescinding. Contact municipality and remind of need for proper treatment and monitoring.	If EBWO or PDWA is in effect, discuss progress or remedial works and rescinding with ER.	Provide results to EPB
Post Special Samples		Email results to ER and HD. Enter data	Contact HD if EBWO or PDWA is in effect, discuss progress or remedial works and rescinding with HR.	If EBWO or PDWA is in effect, discuss progress or remedial works and rescinding with ER.	Perform TC and FC on each sample and perform an *E. Coli* test on any positive.

Source: Saskatchewan's Interim Procedure for Positive Bacteriological
Follow-up Procedure for Systems Regulated by SERM
Government of Saskatchewan
Saskatchewan Environment and Resource Management
Saskatchewan Health
Exhibit C-16 Tab A10

With the introduction of this protocol, SERM representatives in the field were provided, for the first time, with a compliance tool that could be effective. The protocol authorizes a precautionary drinking water advisory (PDWA) to be issued by the EcoRegion in consultation with the health district whenever there is a concern that water problems may exist. The protocol states PDWA's should be issued on evidence of:

- significant deterioration in source water quality (ie high turbidity due to runoff and other events);
- persistently low chlorine/disinfectant residuals (ie <0.5mg/L of total chlorine residual or <0.1mg/L of free chlorine residual);
- the bacteriological monitoring results show a persistent total coliforms and overgrowths;

- lack of adequate treatment component(s) or equipment malfunctions in the treatment plant or distribution system; or
- persistently high concentrations of chemical parameters such as arsenic, boron, trihalomethanes, etc.

The protocol advises that in the case of microbial contamination the PDWA should advise the public to boil their water. In the case of chemical contamination, the public is to be advised to look for alternative water sources of acceptable quality.

The public health officers retain jurisdiction to issue emergency boil water orders (EBWO) due to microbial contamination of drinking water. The protocol states an order should be issued on evidence of:

- confirmed presence of fecal coliforms combined with inadequate treatment;
- confirmed presence of *E. coli*; or
- where epidemiological evidence indicates that the drinking water is responsible for an outbreak of illness (such as gastrointestinal illnesses).

With respect to rescinding an EBWO or a PDWA, the protocol provides:

> EBWO or PDWAs are usually rescinded as soon as the microbiological quality, turbidity, particle counts, and disinfection residual of the treated water in at **least two consecutive sets of samples** have returned to acceptable levels or when the treatment or distribution malfunction has been corrected and sufficient water displacement, with water of confirmed acceptable quality, has occurred in the distribution system to eliminate any remaining contaminated water.

In the case of a disease outbreak, the protocol advises "boil water orders are usually rescinded after the above conditions have been met and when surveillance indicates that the incidence of the illness in the community has returned to background levels."

Mr. Meekma testified that since the drafting of the above protocol in the summer of 2000 he now spends 75% of his time primarily on water as a result of being instructed to give the safety of drinking water priority. He also stated that prior to June of 2000, his other duties simply did not allow him time to chase communities that did not submit the required samples. He testified that now if a community does not submit the required samples after being urged to do so, a PDWA is issued. He stated he has issued approximately 12 PDWAs in his area up to November, 2001, although not all of them are for non-submission of samples.

FINDINGS

50. The bacteriological response protocol which arose out of the Cabinet Information Item in June, 2000, and the Cabinet Decision Item which followed in November 2000, was a very positive step, and an effective one in increasing the amount of municipal compliance with bacteriological sampling. However, it must be regarded as a minimum response in terms of resources devoted to quality drinking water in this province.

(h) Operator Training

As will be reviewed subsequently herein, the province has introduced a mandatory certification program for operators which has a five-year phase-in period to July, 2005. This leaves a further three years before the requirement is fully effective. Before discussing the mandatory certification program, it seems reasonable to review the state of the voluntary program which remains in existence, as far as continuing education is concerned.

(i) *Voluntary Program*

SERM and its predecessor participated in water and wastewater operator training from the 1960s until the end of 1996, when SERM exited the training area coincidentally with its adoption of the new environmental protection model based on EcoRegions that was outlined earlier. Originally, most of the training was done via a one-week annual operator school held in Regina. In this period of time instruction was provided by SERM staff, consultants, and industry experts. In the early 1980s SERM moved away from the one-week school in favour of hosting single topic workshops at different locations throughout the province. The hope was to provide more variety and attract more operators by presenting more courses locally. During this period SERM offered between 10 and 14 courses annually. In the 1990s SERM and the Saskatchewan Water and Wastewater Association (SWWA) began co-sponsoring workshops until the SWWA took them over altogether beginning in 1997.

Commencing in 1977, a voluntary certification program was introduced that was overseen by an operator certification board authorized by the predecessor legislation to EMPA and appointed by the then minister of the environment. The board consisted of three water/wastewater utility staff from communities of various sizes. Its purpose was to review and decide on applications of facility owners to operate sewage works, industrial effluent works, and waterworks, and to review any matter related to training and certification of operators of these facilities. Operators could apply to the board to be certified in one of four categories, namely: water treatment, water distribution, wastewater treatment, and wastewater collection. There were four levels in each class, and the operator could only be certified up to the class of facility in which he/she was then working. The educational qualifications required of the operator increased over time to Grade XII for Classes I and II and a two-year water-related post high school technology course for Classes III and IV. Certification was determined on the basis of the amount of time logged by the operator in the relevant classification, including time as operator in charge. As the certification program was voluntary, no examination was required, and the certificate was issued on a site-restricted basis only.

In 1991 SERM initiated a review of the voluntary certification program. It established a broadly-based certification advisory committee including representatives from the SWWA, the operator certification board, the Saskatchewan Institute of Applied Science and Technology, the Saskatchewan Water Corporation, Saskatchewan Urban Municipality Association, the Saskatchewan Association of Rural Municipalities, along with a number of representatives from SERM. The mandate of the committee was to conduct a review of the program for certifying nearly 1,000 provincial water and wastewater treatment operators.

In April, 1992, this committee conducted a survey of approximately 840 operators in 650 communities on the topic of operator certification. The response rate received was 32% from operators and 45% from the communities. The survey gathered a large amount of statistical information (age, education, experience of operators) in communities in five different population ranges from under 100 to over 5,000. One of the conclusions of the report was:

> The majority of communities and operators support mandatory certification of the operators of Saskatchewan's water and wastewater utilities. Related trends:
>
> (a) Operator and community support increases in direct proportion to the size of the community;
>
> (b) Support is slightly higher from certified versus uncertified operators; and
>
> (c) Support is only very slightly lower amongst the older operators.

In September, 1994, the certification advisory committee published a document entitled "Certification Program Review." The document provided background, reviewed program options for certification including, maintaining the existing voluntary operator certification program, discussed the implementation of a mandatory certification program following the Association of Boards of Certification standards that were well recognized throughout North America, or implementing a modified certification program. It recommended the ABC mandatory certification program.

The executive summary of the report succinctly set out why the voluntary program had been reviewed. It stated:

> There are many reasons why a review of the province's existing Water and Wastewater Operator Certification Program was necessary at this time. Some of these are: poor compliance with provincial regulations, continued poor attendance at training events, increased municipal liability due to untrained operators in charge of complex and expensive infrastructure, unnecessary injuries, wasted dollars and wasted natural resources, public scepticism about drinking water quality/safety and environmental pollution from wastewater discharges, little interest by operators or potential operators in the industry as a career opportunity, no criteria for communities to hire or promote operators, and limited employment mobility for operators. The continued inability of many municipalities to provide even the most basic assurance of safe drinking water, even when adequate capital works are in place, is another reason why this review of certification and training was necessary.
>
> There is concern that Saskatchewan will continue to fall further behind other jurisdictions who are embracing and implementing mandatory certification programs. There is also concern that Saskatchewan will not have knowledgeable operators, and will be unable to provide the public with the assurance that the operators of their water and wastewater treatment systems are competent. There needs to be accountability to the public with respect to the qualifications and competence of municipal operators. At the present time, less than one quarter of municipal operators are certified under the voluntary program.

With respect to the voluntary training program that had been in existence in the province, the report noted:

> During the ten year period ending in June, 1992, the average number of attendees at skill training workshops, seminars and conventions has been approximately 310. This is of a total of approximately 1,100 water and wastewater utility operators in the province. Thus the attendance rate is only about 30%.

The report noted:

> One-half of all operators currently working in Saskatchewan have attended one or no workshops during their working careers.

In the fall of 1995, SERM included in its budget proposals a cost item to make operator certification mandatory in 1997. The proposal was not approved by Treasury Board. In the July, 1996, issue of *The Clear Water Reporter,* SERM reported:

> SERM is planning to continue consultations with the Saskatchewan Institute of Applied Science and Technology (SIAST) and the Saskatchewan Water and Wastewater Association (SWWA) in relation to how certification and training of operators can continue and be enhanced under the existing voluntary operator certification program.

In the fall, 1997, edition of *The Clear Water Reporter,* SERM reported:

> SERM is working in partnership with the Saskatchewan Water and Wastewater Association (SWWA) to deliver expanded services to operators in Saskatchewan that it cannot do itself. Since the founding of SWWA in 1982, SERM and SWWA have co-sponsored many conferences and specialty workshops. After several years of taking a more active role in SERM's operator training program, SWWA completely took the training program over this year. SERM will remain active in operator training in an advisory capacity. In addition, SWWA has expanded the circulation of its newsletter, *The Pipeline,* to take over publication of news for operators and other interested

> individuals from *The Clear Water Reporter.* Although this is the last issue of *The Clear Water Reporter*, SERM will continue to publish information for operators through *The Pipeline.*
>
> SWWA will continue its present role in operator training and SERM will work on the regulatory changes required to bring about mandatory operator certification.

As reviewed earlier herein, the operators of the plants department in North Battleford did not participate in continuing education directly related to water treatment. The fact they received very little training after completing a basic water treatment course is a circumstance that has a bearing on how the surface water treatment plant was operated from March 20, 2001, to April 25, 2001.

As will be observed from the foregoing, SERM basically withdrew from direct participation in operator training from the time it proposed mandatory certification in 1995, even though such training did not receive approval until 1999. If, as SERM witnesses testified, it was assumed that operators in North Battleford were well trained, the records of the operator certification board would have demonstrated that this was not the case.

FINDINGS

51. The September, 1994, certification program review conducted by the certification advisory committee notified SERM that operators of water treatment plants in the province were, for the most part, poorly trained. SERM was also informed that one-half of all operators currently working in Saskatchewan had attended one or no workshops during their working careers.

52. Information was available to SERM that, had it chosen to inquire, would have demonstrated operators of the plants department in North Battleford were not participating in ongoing education related to water treatment.

(ii) *Communication Policy with Operators*

From 1979 until the fall of 1997, SERM published a quarterly newsletter entitled *Saskatchewan Operators' Clear Water Reporter.* Each issue contained articles on water and wastewater treatment. The newsletter was used by SERM to report changes occurring within its own organization and in the industry. It provided coverage of conventions put on by SWWA and usually had a question and answer section called “Certification Corner.” This publication had an annual supplement on training programs for the upcoming year including not only workshops and conventions to take place in Saskatchewan, but also correspondence courses available through Western Canada Water and Waste Water Association, California State University, Northern Alberta Institute of Technology, etc. A review of a number of issues of this newsletter supports the view that it was a very useful publication for operators of water and wastewater works should the operators choose to read it. As noted earlier, there is some debate about whether every operator in the province received this publication, or only those persons who were registered as members with SWWA, or who were registered with the voluntary certification program. The SWWA published its own newsletter called *The Pipeline* which also contained information articles on the water and wastewater industry.

An article published in *The Clear Water Reporter* in its winter, 1994 edition was entitled “Giardia and Cryptosporidium in Surface Waters.” This same article was re-published by *The Pipeline* in its May, 1999, issue. The article pointed out:

> In 1991/92 a 12 month long scientific study was performed in 10 Canadian municipalities (including one in Saskatchewan) in which 113 samples of raw surface water and 112 samples of treated water were monitored for *Giardia lamblia* and *Cryptosporidium parvum* cysts.
>
> In the raw water samples, 19% were found to contain *Giardia lamblia* cysts and 11% contained *Cryptosporidium parvum* cysts. In the treated water samples 14% contained *Giardia lamblia* cysts and 7% contained *Cryptosporidium parvum* cysts.

The article went on to point out “inadequate or improper treatment of surface waters for inactivation or removal of parasites such as *Giardia lamblia* or *Cryptosporidium parvum* poses a very real risk to consumers." It stated that "consumption of inadequately treated surface water, incomplete conventional treatment, and poor operation or equipment malfunction were frequent causes of outbreaks." The article went on to refer to the recent outbreak of cryptosporidiosis in Milwaukee, Wisconsin, in 1993, and another one in the Kitchener/Waterloo area of Ontario in the same year. Under the heading "What should an operator do?" the article emphasized that the risk from giardiasis and cryptosporidiosis could be reduced by achieving optimal performance from the surface water plant and this meant that operation should, among other things:

- Ensure treatment processes, especially coagulation, flocculation, filtration, and disinfection are in continuous use and are always working at peak efficiency.

- Keep filter runs to a reasonable length to avoid breakthrough of turbidity. Use extreme caution when recycling backwash water through the treatment plant because it may have high concentrations of *Giardia lamblia* and *Cryptosporidium parvum* cysts. Also consider filtration to waste when first returning a filter to service.

- Be careful when taking any process out of service at any time. Make changes to flow rates especially through clarifiers and filters very slowly.

In a number of other issues, *The Clear Water Reporter* touched on *Giardia lamblia* and *Cryptosporidium parvum* and how the risk from these parasites might be minimized. None of the articles specifically stated that chlorine does not kill *Cryptosporidium parvum*. A person reading the articles however, would understand that the main barrier against the cysts in treated water was optimization of the surface water plant, and not disinfection.

SERM witnesses testified that they assumed operators receiving these publications in fact read them. This assumption does not appear to have been correct based on the evidence heard in this inquiry.

FINDINGS

53. SERM's assumption that operators receiving copies of its quarterly publication entitled *The Clear Water Reporter* were reading and understanding articles dealing with water treatment published therein was wrong.

54. Industry publications are no doubt useful and valuable sources of information, but are not an effective means of communicating important information to operators of water treatment plants.

RECOMMENDATIONS

23. That in the future, if SERM wishes to bring to the attention of operators information it considers important, it do so by letter or bulletin, stating the information and why it is important.

(iii) *Mandatory Certification*

In February, 1999, SERM received approval from Treasury Board to implement a mandatory certification program. SERM prepared draft operator certification regulations and standards and circulated them to members of the certification advisory committee as well as a number of government departments. Two areas of the proposed regulations were controversial, at least in the minds of certain of the stakeholders who participated in a March, 2000, review of the draft standards.

The regulations proposed to exempt operators who work in water treatment facilities serving a population under 500 and who are not treating surface water. This exemption applied to 50% of the communities in

Saskatchewan. Unlike certification requirements for Classes I-IV, the regulations proposed a small systems certificate. A Grade X education or equivalent was also proposed, with six months of experience in the facility, and a lesser certification examination than Class I. In comparison, a minimum of Grade XII education is necessary for Class I and II, and one year experience is required for Class I.

The second area of controversy related to the provisions allowing operators already working in a facility when mandatory certification takes effect to substitute appropriate facility work experience or specific technical training for missing educational requirements. This provision means that a person could have less than Grade X for a small system and less than Grade XII for a Class I or II system as long as they have the appropriate facility work experience or sufficient continuing education credits to make up the difference.

The Saskatchewan Institute of Applied Science and Technology (SIAST) expressed its disappointment "with the recent redefinition of small systems, exempting a majority of Saskatchewan communities from the rigour necessary to ensure safe utility operation in Saskatchewan." SIAST made the point that a community of 50 people that operated a surface water system would require a certified operator, but a community of 490 persons with a ground water systems would not. SIAST pointed out that in the larger system, the distribution system would have between 200 and 300 connections, each connection being a risk factor. As stated: "smaller systems mean fewer connections and therefore the risk of contamination by cross-connection, inadequate disinfection, and improper repair is minimized." SIAST also questioned "the need for this classification to allow experience as a substitute for formal basic education without limitation." SIAST concluded its letter:

> We believe that the proposed regulations and standards are not in the best interests of certification program credibility nor in the public interest. We are concerned that it fails to ensure the protection of public health and safety, particularly for small systems.

SERM responded to the foregoing concerns in a letter dated April 17, 2000. The letter stated:

> We feel that the risks associated with these facilities will be

> minimized with a small system certified operator due to the type of equipment used in ground water treatment plants and sewage lagoon systems.

With respect to the Grade X academic requirement, the letter SERM stated:

> We propose that the educational requirements of Grade X remain as the minimum standard for small system certificates. This is the same in other jurisdictions with a mandatory certification program. As no special allowances are being made for existing operators, it is felt that the initial steps of the program must allow communities flexibility in ensuring that current employees will be certifiable.
>
> This does not preclude that changes to the standards can be made as the program matures.

With respect to the right to substitute unlimited experience for educational requirements, the letter responded:

> Based on the same rationale used for the minimum educational requirements, we propose that the standards allow unlimited experience substitution for missing education. The Department intends to state, in the program guide, that the policy of having unlimited substitutions will be reviewed and that the intent is to restrict this practice in the future.
>
> The proposed substitution rule has, in effect, provided a two-tier system which allows existing operators, with their years of service, to account for missing education while new operators will not have the experience necessary for allowing for substituting experience for education.

The proposed mandatory certification regulations were circulated to various government departments for comment. The Department of Municipal Affairs, Culture and Housing commented:

> It appears that the standards are very low considering that the water is being treated for human consumption.

SERM's response to the comment was:

> The Department established the minimum requirements to address situations which may impact on current operators becoming certified. We will be reviewing the standards over the next few years to determine what changes are required.

The Water Pollution Control and Waterworks Regulations were amended on July 14, 2000, to require all operators of water and wastewater facilities to be certified within five years. SERM acknowledged that "at present Saskatchewan is the only jurisdiction with a small system classification and represents the need to address the concerns smaller communities have in hiring qualified operators."

The major components of the mandatory certification program as enacted in *The Water Pollution Control and Waterworks Amendment Regulations* enacted pursuant to s. 38(1) of EMPA that have not already been commented on in the foregoing are:

1. Within five years after the coming into force of the regulations "every municipality and owner of a waterworks or sewage works shall ensure that the operation, repair and maintenance of those works is under the direction of an operator who holds the corresponding certification for the classification of those works." (Reg. 30.1)

The wording "under the direction of an operator" means that only one certified operator need be available to the facility. There are no educational requirements for the balance of the operators in the facility. The wording leaves open the question of whether the certified operator need even be employed by the facility, and just how many facilities can one certified operator direct.

2. Any operator who was certified under the voluntary certification program in Class II or higher could write a certification exam in that Class prior to January 14, 2002. Everyone else must write the examinations for each class. In other words, an operator working in a Class III facility who is not certified under the voluntary program as a Class III operator would first have to write the Class I examination, then the Class II examination, and finally the Class III examination. This provision resulted in a significant number of operators applying for voluntary certification prior to January 14, 2002 in order to take advantage of the fast track.

3. There are no specific continuing education requirements in the regulations. However, certificates are issued for a term only, which at the moment is two years, and are renewable thereafter. On a renewal the board has the right to request a renewal applicant to "comply with any other requirements that may be set by the board." (Reg. 30.2(2)(b)) SERM witnesses indicated the board will have the right to require continuing education on the part of an operator in the future as a requirement in the certificate issued. SERM has attempted to emphasize continuing education in the promotional material published with respect to the program.

FINDINGS

55. The mandatory certification program is a positive step to improving the quality of drinking water in the province.

56. With the low certification requirements for small system operators, and the borderline requirements for Class I and II operators, a continuing education component is necessary. North Battleford shows the voluntary approach to continuing education has not worked in the past, and there is no reason to believe it will in the future.

57. An amendment to the regulations requiring a certain number of continuing education credits in order to be eligible for renewal certification will not only be a positive influence on operators, it will also put municipalities on notice that the requirement is non-discretionary and is a cost of operating the water treatment plant.

58 A necessary corollary of making continuing education credits mandatory, is making available the programs that will allow operators to qualify for such credits.

RECOMMENDATIONS

24. **That the government amend the operator certification regulations to provide that, after the first renewal, each operator must take a certain number of continuing education credits to qualify for the second renewal, and each renewal thereafter.**

25. **That the government ensure there are sufficient continuing education courses available to meet the needs of operator continuing education.**

(i) Adequacy of the Policies, Practices, and Guidelines of SERM and the Government of Saskatchewan

The risk-based model employed by SERM since 1996 was arrived at on the basis of economic considerations (i.e. what SERM or the government thought they could afford based on priorities), and has nothing to do with how best to safeguard the health of the population, all of whom consume water.

Until North Battleford, SERM was able to rely on the assumption that all but the poorest, smallest communities had the resources, the knowledge, and the will to operate a safe water treatment program and distribution system. This assumption required it to assume that all municipalities would not only meet the minimum guidelines set out in the Municipal Drinking Water Objectives, but would also adopt industry practices that would minimize the risk of water-borne pathogens such as *Cryptosporidium parvum* and *Giardia lamblia*, which the guidelines did not address. SERM made this assumption knowing that only 25% of the operators in the province were registered with the voluntary certification program, and that only a small percentage of operators regularly attended continuing education courses. By 1996 it also knew, based on the 1994-95 water compliance report, that many municipalities were not submitting the required samples, and of those that did a significant percentage were not meeting the minimum guidelines.

North Battleford demonstrates SERM's assumptions in the foregoing respect were wrong. In fairness, as the evidence indicates, the policy adopted was not the choice of all SERM employees. Because of this policy based on assumption only, SERM did not know that North Battleford had been submitting chlorine residual samples below the legislated standard for several years before September, 2000. SERM also did not know that the technology in the North Battleford plant, and its manner of operation, were well below industry standards, considering its raw water source.

The risk-based model adopted by SERM since 1996 is a reactive one, and has only one meaningful element apart from its role as firefighter after the fact, which is the bacteriological sampling program. This program is of benefit to those who choose to submit samples, but there is still no monitoring or follow up on those communities that do not. The bacteriological response protocol was a reaction to Walkerton and is limited to early detection of coliforms such as *E. coli* that can produce serious enteric disease. Walkerton has increased compliance of bacteriological testing by communities. Dr.

Horsman, director of the provincial laboratory, testified the samples doubled following Walkerton and have levelled off at approximately 80% above the pre-Walkerton level. However, had Walkerton never happened, there is nothing in the evidence to suggest the protocol would have come into existence. This is mentioned simply to emphasize the reactive nature of the policy.

One of the problems with SERM as a regulator, in recent years, is its lack of knowledge. It has no timely information on how the operations in any particular plant are being conducted, or the quality of the persons conducting them. All it knows is whether bacteriological samples submitted are good or bad. Even if SERM upgrades its computer system to flag those communities that have not submitted the required samples and follows up on them, without an ongoing quality inspection program it will not be able to truly assess the risks associated with the water being produced in the plant. A small example, perhaps, is North Battleford's chlorine sampling practices following the September, 2000, coliform event. The evidence is that chlorine residuals were, on occasion, being recorded on bacteriological submission forms after the water had been run for an hour or more. Relying on sample results alone can be misleading on occasion.

The CDI has delivered nine additional protection officers for the province who are knowledgeable in water treatment. These persons have been placed in the EcoRegions and have other duties to perform apart from water quality duties. Mr. Meekma testified that the additional protection officer placed in his area has resulted in each of them taking 50% of the area and performing all duties required therein. The CDI contemplates additional inspections on municipalities, but the inspection program is primarily targeted at known non-conforming facilities. Additional inspections of non-conforming facilities will be an improvement to what has existed. However, there is still no program for ongoing inspection of all water treatment facilities on a regular basis for the purpose of determining not only compliance with all permit requirements imposed on the facility, but also to assess the quality of the infrastructure and operation procedures within. The fact the additional protection officers are attached to the EcoRegions does not ensure that the priorities of these persons in due course will not gravitate to other activities, as has occurred in the past. In the end, the model remains a reactive one and differs significantly from the proactive model of inspection used in the food handling industry and the major resource industries.

The mandatory certification program for operators is a positive step, but SERM admits the standards have been deliberately set low at this time. The program itself is a supervisor certification program as opposed to an operator one. There is still plenty of opportunity for municipalities to employ under-trained persons as operators. The quality of continuing education programs that will be available and whether they will be a requirement has yet to be determined. As pointed out by a public health inspector, food workers and swimming pool operators also must be trained but operational problems still arise.

Beyond the legislated standard for chlorine residuals, SERM has been reluctant to establish mandatory standards with respect to water treatment. Likewise, it has been reluctant to enforce compliance on those municipalities who do not meet requirements set out in their permits to operate. Two reasons were offered. One is that in its opinion, mandatory standards would not improve compliance. The second is that one level of government should not tell another level of government how to do its job, or how to spend its money. Neither rationalization is accepted.

The opinion that mandatory standards would not improve compliance is offered against the background of a policy that deliberately did not make known to the public those municipalities that were in non-compliance. In other words, most persons in the communities that were non-compliant did not know that to be the case. Enforcing compliance will bring to the attention of the members of the community the fact there is a problem with the safety of the drinking water, and it is suggested they would be more likely than not to prompt action from the civic administration to deal with the problem. If a community's water supply is so bad, or its treatment facilities so bad, that it cannot possibly comply, then the question may be asked why such a system should be allowed to operate. If this point is reached then other solutions must be canvassed.

As for the comity approach adopted by SERM towards municipalities, it has nothing to recommend it in matters of public health if, in consequence, health of the persons in that community is placed at greater risk. If a case can ever be made for selective enforcement, public health is not an area where this should occur.

In January, 1999, the province issued a document entitled "Water Management Framework." A summary of this document is attached as

Appendix "F." It identifies nine goals, 16 objectives to address areas requiring improvement, and 58 action items to accomplish the objectives. The document states:

> The importance of the quality of drinking water to Saskatchewan residents is emphasized in the Framework. Reflecting this importance drinking water quality is associated with 5 of the 9 goals, 6 of the 16 objectives, and 13 of the 58 actions.

There is no reference to enforcement as a means of encouraging compliance on the part of water treatment plant owners. In contrast, one of the actions proposed for septic tanks is "ensure adequate monitoring and enforcement of septic tank regulations."

SERM's concern about adopting a compliance or enforcement policy that would require a municipality to expend money to improve the quality of the treatment processes in a water treatment plant should not be a concern. There is no difference in ordering improvements before the fact than after the fact, as occurred in North Battleford. Before the fact has the advantage of consumer costs being incurred incrementally as opposed to all at once. The consumer will not pay any more and will have safer water along the way.

At least in the cities, water utilities are run on a user pay basis. The inquiry did not hear evidence on what transpires in the rural areas. A comparison of water utility rates charged by 13 cities in Saskatchewan indicate there is a wide variation in the rates charged. For example, for a minimum user of water, the highest rate is Melville at $63 and the lowest rate is North Battleford at $16.80. As long as a municipality's water utility rate falls within the range of utility rates for water being charged elsewhere in the province, it is difficult to imagine why a consumer who is properly informed on the reasons why the rates are required would object. A salutary effect of having the regulator impose the requirements for improvement, where required, is that it removes political debate in the community about whether such improvements are necessary. It is time the treatment of drinking water be approached from the health perspective only, to the exclusion of the political or economic perspectives, at least as far as ongoing operations are concerned.

If North Battleford is any example, not all of the councillors and administrators of municipalities fully appreciate the health aspects of drinking water, and the municipality's statutory responsibility to produce potable, meaning safe, water. While it was not evidence at the inquiry, a spokesperson for the Urban Municipality Association in the province was recently quoted as saying words to the effect that it was quite an imposition on a municipality of 1,000 people to have to incur the cost of $1,000 to have its water treatment operator certified. If the quoted statement is true, it is foolish. Such an expenditure, amounting to $1 per person in that community, is less than the price of one purchased bottle of water. It is time to take the public health issue of the safety of drinking water off the political table and establish firm ground rules, enforced by a knowledgeable regulator, that every community will abide by.

The Water Management Framework document demonstrates that the government and SERM are well aware of what is required to produce safe drinking water, including watershed management and protection of ground water sources. However, this framework document lacks an implementation strategy.

FINDINGS

59. The current risk-based model employed by SERM since 1996 is arrived at on the basis of economics (what it or the government thinks it can afford among other priorities), and has nothing to do with how best to safeguard the health of the population, all of whom consume water.

60. As presently structured, SERM is an inadequate and ineffective regulator of drinking water.

61. SERM is well aware of what it takes to produce safe drinking water, including watershed management and protection of ground water sources, but the Government of Saskatchewan has not provided it with a mandate to pursue an implementation strategy.

PART VII - REGULATORY REFORM

While detailed reform proposals are beyond the scope of this inquiry and would require weeks of additional evidence, the facts of the North Battleford experience suggest that regulatory reform is necessary and that detailed consideration needs to be given to a significant shift in the approach to drinking water safety in this province.

The risk-based model, and the partnership approach used by SERM throughout the latter part of the 1990s, merely led to passivity and inertia in North Battleford and a travesty of the regulatory role. SERM's attempts to achieve results through the gentle art of persuasion failed.

I have found that the lack of an inspection policy on the part of SERM was a circumstance that led to the contamination of the public water supply in North Battleford, and that SERM's role as a regulator was inadequate and ineffective leading up to the events of April, 2001. I have also found that SERM's minimum component risk-based model for regulation of the water treatment industry accounts for both of the foregoing conclusions.

The problems with compliance in the water treatment industry and the associated increase in risk to public health have been known for at least the last six years. The problems have been identified, policy documents such as the water framework agreement and the CDI have been produced, and yet there remains a hiatus between knowing the problem and how to solve it on the one hand, and doing anything about it on the other. One of the reasons for this hiatus is the diffusion of responsibility to administer water quality. Not only the various government departments, but also SERM's head office and the EcoRegions all have different priorities. A second reason is that both SERM and the government have perceived that they do not have the financial resources to do anything more about solving the problem. On this latter point, the question may be asked if the government is practising false economy. In a draft of the CDI dated September 22, 2001, at page 33, it was noted:

> Implementation of the recommended actions could save the province on health care costs. Health Canada has estimated the health care costs associated with water-borne diseases to be $200 million per year. No number has been estimated for Saskatchewan. However, based on Health Canada's number, the cost in Saskatchewan is estimated to be about $8 million per year.

The government is aware that water quality is a very high priority with a large segment of the population in the province. Page 3 of the CDI, notes:

> In April, 2000, SERM's Public Opinion Survey on Environmental Issues (Arcas) showed water quality is a strong concern, stating that: 1) the environmental issue of water quality has a significantly higher average score compared to other environmental issues in all regions; 2) the most important environmental issue that affects the respondents personally is water quality; and 3) the most important environmental issue in the province as a whole was stated to be air pollution, followed by water quality.

The province acknowledges its constitutional jurisdiction over water in the water framework agreement, page 17 of which states:

> The provincial government is responsible for all water management except water on federal land, international waters and regulation of navigation and fish habitat.

The province also has constitutional jurisdiction over public health and has acknowledged this in the enactment of *The Public Health Act, 1994* and its predecessors.

The question may be asked whether the province is fulfilling its constitutional obligations with respect to public health and with respect to water quality by devolving onto the municipalities all responsibility to produce safe drinking water, without also providing a regulatory framework which gives some assurance to the public that the municipalities will carry out the devolved responsibility in a manner that will in fact provide safe drinking water. Any commentary I have read on this subject suggests the answer is a very strong "no."

The reason the answer is "no", as the evidence in this inquiry indicates, is that not all municipalities have the knowledge, the skill, or the will to manage increasingly complex water treatment processes. At the municipal level, operators change, administrators change, city councils change, technology changes, knowledge in the industry changes, and it is simply too much to expect that every little municipality is going to manage its way through all of these changes without some form of effective supervision from senior government.

The one aspect about the production of safe drinking water that falls clearly in the area of provincial responsibility and has not been devolved to the municipalities is watershed and ground water source protection, which is the first barrier to the production of safe drinking water.

Effective regulation of drinking water, like any other type of regulation in the health field, requires both a clear mandate, and an effective organization.

A mandate for the regulation of safe drinking water requires:

1. source water protection;
2. the setting of standards, policies and regulations for operation;
3. the setting of standards for design, construction and upgrades of water treatment facilities;
4. the issuing of licenses or permits to operate; and
5. a compliance/enforcement policy directed at upholding all requirements imposed.

The organization component should include:

1. the legislative jurisdiction required;
2. a clear mandate to exercise the jurisdiction;
3. a technical and policy capability;
4. adequate staffing; and
5. adequate funding.

SERM has the technical and policy capability to perform as a regulator of drinking water, but is missing, in its present organization, to a greater or lesser extent, each of the other components.

It was suggested in the course of final submissions that an independent regulatory agency or commission devoted to drinking water safety should be established. One of the advantages of an independent regulatory agency or commission is security of funding and security of purpose. Budget increases may not always be available to such agencies when requested, but budget reductions tend not to be as drastic as can occur in government departments on occasion, as in fact occurred throughout the departments of the Government of Saskatchewan in the 1990s. When independent agency budgets are reduced by government, it is a much more transparent process, which in itself offers a certain protection against such reductions. I have considered the pros and cons of an independent agency to act as the regulator of safe drinking water, and have concluded that in the Saskatchewan context it is not a practical alternative considering the small population and the costs associated with independent administration.

In proposing the reforms which follow, in the narrow sense they are required to assure the citizens of North Battleford that in the future their drinking water is less likely to become contaminated. In the broader sense, the incidental evidence received at this inquiry suggests the reforms, which might be considered excessive for the drinking water security of one city, have application for many other communities.

The reforms proposed are directed at establishing a clear jurisdictional mandate over drinking water in the province and have four objectives. The means of accomplishing the objectives is by legislative amendment to *The Environmental Management and Protection Act* (EMPA).

The most striking feature of SERM's regulation of drinking water to date, apart from its ineffectiveness, has been the total lack of transparency. Budgets were cut, and supervision was minimized to the point SERM was prepared to withdraw altogether from this field of regulation but for bacteriological follow-up when required. The public was completely unaware of any of these developments. In advocating the reforms be accomplished through legislative amendment, as opposed to by government or department policy, the purpose is two-fold: in the first place, to establish clear legislative jurisdiction for the drinking water portfolio; in the second place, to provide some protection that the mandate cannot be eroded in the future in a non-transparent manner.

The four objectives of the reforms are:

1. to establish a separate drinking water quality unit in SERM, whether it is a called a branch, a directorate, or a section, with its own "director";
2. to provide the unit with all of the jurisdiction EMPA currently provides SERM over waterworks and, in addition, provide this unit with a mandate and jurisdiction to protect watershed and ground water sources of drinking water;
3. to establish that within the unit there exist a separate compliance section; and
4. to require that the unit produce an annual report to the legislature on the state of drinking water quality in the province.

In order to provide the new drinking water quality unit with complete jurisdiction over source water protection, consequential amendments would be required to a number of statutes and regulations. I am not in a position to recommend how the jurisdiction be exercised but it should include as a minimum the right to review and comment on all development proposals, whether resource, agricultural, or urban, that have a potential to adversely impact source waters. It should also provide the unit with an independent right to appeal any proposal implemented with which it does not agree. The purpose of the consequential amendments would be to end the diffusion of responsibility within various government departments for controlling activity that may adversely impact, to an unacceptable level, source waters.

It is intended that the proposed water quality unit would not only perform the function of an effective regulator, but would also act as the coordinator for the program delivery component of drinking water. Saskatchewan Water Corporation (Sask Water) has engineering and science expertise with respect to the construction and operation of water utilities, and also with respect to watershed and ground water source monitoring. Based on the two-way flow of information between the proposed unit and Sask Water, the water quality unit should be able to employ the services of Sask Water (on a contract basis if necessary) to perform science and engineering-related work that the water quality unit determines is required. The department of Municipal Affairs, Culture and Housing has an interest in water quality (see page 247) and is often a vehicle for funding infrastructure. To the extent infrastructure funding is available for drinking water related projects, it would make sense that the water quality unit be consulted on where the greatest needs may exist to assist in prioritizing the spending of infrastructure dollars. The proposed unit could also take the lead as the repository of all relevant information on the state of drinking water quality in the province, and in advising when regional water facilities would better serve the objective of safe drinking water.

The proposal outlined by Sask Water at pages 249 to 250 appears to be an excellent blueprint for action to improve the quality of drinking water in the province in the most economically reasonable way. As noted at page 246, in August, 2000, the president of Sask Water stated: "We wish to see one department responsible for drinking water regulation and monitoring." The letter recommended that SERM be the department. The proposal for reform put forward herein agrees with the Sask Water president on the clear lines of responsibility required to implement a safe drinking water policy and the need for central coordination of drinking water regulation and monitoring. The foregoing proposal differs only to the extent it recommends not the department of SERM having responsibility for drinking water, but the water quality unit within SERM. I am of the opinion that within the department of SERM there are too many conflicting points of view and priorities to leave the responsibility to the whole department.

There has been no reference made to the Department of Health in the foregoing. Certainly the Department of Health has demonstrated the most consistent ongoing concern about the public health safety aspects of drinking water, and it is not proposed herein that its present jurisdiction with respect to the monitoring of small water systems be altered. On this point the issue seems to be how such systems can be efficiently monitored in the most cost-effective way. The inquiry did not receive evidence on this point and, consequently, I have no opinion. However, as noted earlier, public health inspectors already have a very heavy work load without the small water system monitoring duties. It would make sense to have drinking water monitoring in the province performed by the same compliance organization. In any event, it is contemplated that the results of all such monitoring also be reported to the drinking water quality unit according to the reporting requirements established by that unit. Likewise, the drinking water quality unit should establish some type of coordination committee to both disseminate information to other departments, and to receive advice from other departments, and the Department of Health should certainly be a member of that committee.

I am persuaded the starting point for effective regulation of water treatment facilities is the permit to operate the facility. It is recommended that no permit be issued for a surface water treatment facility for more than a two-year term and that each permit be customized to the operating requirements of the individual plant, bearing in mind its source of raw water. The regulations should provide that each operator of the plant be personally forwarded a copy of the permit to avoid what occurred in North Battleford, where the operators were not familiar with the contents of the permit. All quality parameters expected of the water treatment plant should be set out in the permit. In addition, the permit should also specify the circumstances in which the plant should be shut down, when water should be run to waste, and the circumstances when the regulator and/or the health district should be notified – circumstances such as process failures, inability to meet the standards in the permit, absence of supervision, etc. As a means of ensuring that the requirements set out in the operating permit are met all of the time, and to discourage persons from thinking the requirements can be ignored for periods of time, the waterworks regulations should be amended to make it an offence to knowingly operate a water treatment facility in contravention of the operational requirements set out in the permit.

I am also persuaded that the regulation of activities such as the production of safe drinking water, which if not performed adequately has the potential to adversely impact the public health of a substantial number of persons, requires the regulator to conduct regular and rigorous compliance inspections of all water treatment facilities. The data that the water quality unit could request from owners and operators is no doubt valuable, but in effect it is a form of self-monitoring which has its weaknesses, not the least of which, as was demonstrated in Walkerton, is falsification of data. Inspection is also the only means of obtaining information as to the true state of the plant and its methods of operation. It is recommended the content of the inspection program include inspection of data and records, physical plant processes, qualifications of plant personnel, plant operations from the quality control/quality assurance perspective, and management of the facility. Section 24 of EMPA provides the jurisdiction for such an inspection program, including the right to order improvements to plant operations. The regulations could provide that an inspection occur before each renewal of permit to operate the facility, and the inspection report could then be taken into account when determining the content of the renewal permit. Between 1984 and 1993, each water treatment facility in the province was inspected annually. It does not seem unreasonable to suggest that each water treatment facility henceforth be inspected at least biannually.

The reason it is proposed that legislative amendments to EMPA establish a separate compliance section within the drinking water quality unit is that capable and effective regulation of drinking water requires that the compliance responsibility be kept separate and apart from program delivery, such as funding, technical assistance, training, or the operation or management of water utilities. This separation is important in order that the compliance function not be compromised or relaxed because of weaknesses or deficiencies in program delivery. At the same time, the focus for the compliance activity of the regulator of drinking water should be solely on the health issue, as it is in the regulation of food.

To date, municipalities in the province, including North Battleford, have no experience with regulator compliance monitoring in recent years. It is therefore considered important that the compliance section of the proposed water quality unit prepare and publish for all municipalities the abatement-enforcement compliance policy that will apply to water treatment facilities. It is important that municipalities know in advance what the policy is and that it will apply to all municipalities. At the moment, the only articulated compliance policy is the one contained in the bacteriological response protocol. The suggested compliance policy should include the steps that will be taken with respect to any non-compliance, or deficiencies in operation, that jeopardize the safety of the drinking water. It is suggested the regulations be amended to provide that in the event of persistent non-compliance by a municipality the regulator may order the replacement of existing management or operators and may temporarily hire replacements as required, at the municipality's expense. The regulations could provide that any such order is effective and is not to be stayed pending an appeal of such an order by the municipality.

The staffing of the water quality unit should include its own scientific personnel, including at least one environmental engineer, to coordinate the source water monitoring and protection component. The staff responsible for the compliance component should be trained on all aspects of water treatment and be knowledgeable of all best industry practices. This is necessary in order to assure proper inspection for compliance purposes and also to know what improvements could be made to the plant or operations that might be incorporated as a condition in the next renewal of the water treatment facility permit. The compliance-inspection staff could be located in the EcoRegions, but should report centrally to the drinking water quality unit. It is considered important to establish an administrative structure that is dedicated to the safety of drinking water, and it follows that its inspection staff should not be put in a position where this priority can be altered by an administrator who has different priorities.

It will be noted that the proposed reforms to the regulation of drinking water do not incorporate the regulation of wastewater facilities. The water quality unit would presumably have the right to set standards for wastewater effluent as part of its source water protection jurisdiction. It is appreciated that drinking water and wastewater are often controlled by the same regulator, and that there are economies to be achieved in combining the activities. If the government is of the opinion it would prefer to operate the regulation of both water and wastewater through the same regulatory unit, the point I wish to make is that such a decision should not alter the recommendations that EMPA be amended to establish a separate drinking water quality unit. For example, the drinking water quality unit proposed, with its own director, might be located in a larger water control and pollution branch such as existed prior to 1993. I consider it important that the regulator of drinking water have its own identity to emphasize that drinking water regulation is in a separate category. Drinking water is a public health category, separate from the regulatory functions that may be performed by other branches of SERM on other aspects of municipal activity that are more related to the traditional environmental mandate. Wastewater regulation is within the environmental mandate. The production of drinking water is not. Prior to 1984, the Department of Health regulated drinking water in the province in recognition of the fact the only reason for regulating drinking water is to protect public health. This emphasis should not be lost, or eroded, in the name of departmental efficiency.

There is a number of reasons for recommending that the drinking water quality unit make an annual report to the legislature on the state of drinking water in the province. First, it is time the topic received higher profile amongst legislators. Second, such a report will provide transparency on the activities of the drinking water quality unit and will act as a report card on that activity which legislators, municipalities, and members of the public can then assess. Third, the report would make public any future erosion of the unit's mandate, which, presumably, would then have to be justified in the legislature.

RECOMMENDATIONS

26. **That EMPA be amended to:**

    (a) establish a separate drinking water quality unit in SERM, whether it is a called a branch, a directorate, or a section, with its own "director";

    (b) provide the unit with all of the jurisdiction EMPA currently provides SERM over waterworks and, in addition, provide the unit with a mandate and jurisdiction to protect watershed and ground water sources of drinking water;

    (c) provide that within the unit there exist a separate compliance section; and

    (d) provide that the unit produce an annual report to the legislature on the state of drinking water quality in the province.

27. **That the regulator pursue a comprehensive inspection policy of water treatment facilities and apply a rigorous abatement-enforcement compliance policy on all water treatment facilities.**

28. **That *The Water Pollution Control and Waterworks Amendment Regulations* be amended:**

    (a) to provide that in the event of persistent non-compliance by a municipality, the regulator may order the replacement of the existing management or operators and may temporarily hire replacements as required at the municipality's expense; and

(b) **to make it an offence to knowingly operate a water treatment facility in contravention of the operational requirements set out in the operating permit.**

PART VIII - SUMMARY OF FINDINGS

1. The North Saskatchewan River has high numbers of *Cryptosporidium parvum* parasites; numbers that are as high as anywhere in North America.

2. There is no coordinated watershed protection program in Saskatchewan on the North Saskatchewan River.

3. The North Saskatchewan River is a difficult raw water source to treat for drinking water.

4. The Municipal Drinking Water Quality Objectives of 1991, and the guidelines of 1996, were not adequate as informational or instructional material for owners and operators of surface water treatment plants on the topics of turbidity and protozoa. By 1996 industry practice with respect to both of these topics had become much more stringent for surface water treatment plants and the document issued in 1996, did not draw attention to this fact. *Cryptosporidium parvum* and *Giardia lamblia* were not identified in either document as a threat to safe water treatment, nor was the relationship between protozoa and turbidity discussed.

5. The 1 NTU guideline for turbidity is so general as to be unhelpful as an objective for surface water treatment where *Cryptosporidium parvum* and *Giardia lamblia* are known to be present.

6. The 1 NTU guideline for turbidity became a trap for municipalities who were not knowledgeable in optimum water treatment practices, a category which included the City of North Battleford.

7. It is inconsistent that two surface water treatment plants obtaining raw water from the same raw water source, in this case the North Saskatchewan River,

should have different requirements imposed in their respective operating permits.

8. Effluent from the sewage treatment plant upstream from the surface water treatment plant does pass over the raw water intake of the surface water plant, at least some of the time.

9. Due to the shifting flows in the North Saskatchewan River, it is not possible to predict when sewage effluent will find its way to the raw water intake for the surface water treatment plant.

10. Prior to April, 2001 the surface water treatment plant was not a "capable plant" by industry standards.

11. The fact that the surface water treatment plant was not a "capable plant" has a direct bearing on the *Cryptosporidium parvum* contamination of March - April, 2001.

12. Prior to April, 2001, there was an absence of quality control parameters and quality assurance policies for the operation of the surface water treatment plant and each operator was left to operate without guidelines.

13. The record keeping system at the surface water treatment plant was primitive, and in many cases, incomplete. The computer record was often too inconsistent with the manual record to be relied upon.

14. The record keeping system did not easily lend itself to third party review.

15. There was no policy in place for internal or external review of the record keeping at the surface water treatment plant.

16. Neither management, nor the operators of the surface water treatment plant fully comprehended the multi-

barrier approach required to effectively remove *Cryptosporidium parvum* from raw surface water.

17. Neither management, nor the operators of the surface water treatment plant knew that *Cryptosporidium parvum* could be present in raw water that measured 3 NTU or less, and could be present in finished water that measured 1 NTU or less.

18. Throughout the 1990s, the city council of North Battleford and its administrators minimized the amount of money they were prepared to spend on the plants department.

19. Senior management of the city, but not city council, knew Mr. Katzell, the long-time foreman, had concerns about the state of infrastructure and equipment in the plants department, and that he considered the department to be under-staffed, but they chose to do nothing about it.

20. Both city council and senior management of the city chose to ignore operator concerns as reflected in the January 12, 2001 letter, although the concerns were subsequently proven to have merit.

21. Throughout the 1990s no one in senior management or on city council had sufficient, if any, knowledge of water treatment processes to appreciate or understand the health risk posed by the surface water treatment plant, bearing in mind its source of raw water, and the aged state of its equipment and infrastructure.

22. Knowing the aged state of its infrastructure, the City of North Battleford kept its water utility rates artificially low throughout the 1990s.

23. Both the City of North Battleford and SERM were aware there were no quality control or quality

assurance guidelines for the surface water plant operation, and no qualified supervisor at the plant from the time Mr. Katzell retired on December 14, 2000, to the outbreak of cryptosporidiosis in the city in April, 2001.

24. The City of North Battleford's mayor and senior administrators remained indifferent to the public health safety aspects of drinking water following the September, 2000, coliform event.

25. Neither the Province of Saskatchewan or the Battlefords Health District had in place a protocol directed at suspected water-borne outbreak of enteric disease. As a result, the investigators in the Battlefords Health District did not have any guidance on how to proceed with such an investigation.

26. The cause of the enteric disease outbreak in North Battleford in April, 2001, was the presence of *Cryptosporidium parvum* in the treated drinking water produced from the surface water treatment plant.

27. The terms required by SERM in the protocol for removal of the boil water order were very appropriate.

28. SERM was right to resist pressure applied by the City of North Battleford to remove the boil water order before it was satisfied it was safe to do so.

29. The remediation work carried out at the surface water treatment plant since April, 2001, has corrected most of the deficiencies in the plant and equipment, and raised the capabilities of the plant to a capable industry standard.

30. The proposed installation of ultraviolet reactors at the surface water treatment plant is an effective supplementary treatment barrier that will greatly reduce the possibility in the future of *Cryptosporidium*

parvum or *Giardia lamblia* entering the city's water distribution system.

31. The new quality control/quality assurance procedures introduced at the surface water treatment plant conform with best industry practices.

32. It is uncertain whether the plants department which retains the same number of operators and the same management structure as existed before the outbreak is adequately staffed and adequately managed.

33. It is uncertain if the City of North Battleford has sufficient reservoir capacity for its water distribution system.

34. SERM's response, from the time it was notified of a possible problem at the surface water treatment plant in North Battleford on April 24, 2001, to the removal of the boil water order on July 25, 2001, was timely and appropriate.

35. The absence of a flagging system that would allow SERM to detect municipalities who do not comply with the requirements for submitting water samples is a serious shortcoming in its monitoring capability.

36. The Battlefords Health District's investigation into the *Cryptosporidium parvum* outbreak was not a circumstance that added materially to the number of persons affected by cryptosporidiosis. By April 19, 2001, the outbreak had peaked one week earlier and the difference in the number of cases between April 20-24 would not have been material.

37. Communication of the PDWA of April 25, 2001, and of the boil water order of April 26, 2001, to the community of North Battleford was timely and comprehensive.

38. There was a systemic failure on the part of the City of

North Battleford to recognize its responsibility to produce safe drinking water. This failure was brought about by the City's collective lack of knowledge on what it takes to produce safe drinking water, and policies that discouraged the possibility it might acquire such knowledge.

39. The Battlefords Health District was conscientious in its role as the regulator of small non-municipal water systems. It not only conducted annual inspections but also provided advice to operators and municipalities when appropriate. The health district also fulfilled its health advisor mandate by notifying the provincial regulators of perceived gaps in the compliance system and of potential health hazards associated with the treatment of drinking water in the health district.

40. The shortage of public health inspectors, as evidenced by the inability of the health district to hire two replacement public health inspectors in the seven or eight month period ending with November, 2001, is a cause for concern.

41. The Battlefords Health District policies for the investigation of enteric disease focussed on routine investigations only. The district did not have a policy directed at how an enteric disease outbreak in the community should be investigated.

42. EMPA and the *Waterworks Regulations* provide SERM with the jurisdiction to comprehensively regulate drinking water in the province.

43. The Government of Saskatchewan, represented by the Cabinet Ministers who constitute the Treasury Board, was aware that SERM's choice to withdraw from water quality management of water treatment plants throughout the 1990s would result in SERM not meeting its legislated mandate to regulate drinking water in the province.

44. The amalgamation of the Natural Resources Department with the Environment Department in 1993, created stresses within the new department on the priorities it should pursue. These stresses were exacerbated as the department continued to undergo budget reductions throughout the balance of the 1990s. Whatever power struggles or discussions went on within the department over budget, the end result was that the quality drinking water program was sacrificed as a matter of choice, not necessity. The choice was made knowing the result would be a reduction in the overall quality of drinking water in the province. The justification for those who made the choice was that s. 14 of *The Public Health Act, 1994* made municipalities responsible for producing potable water.

45. That the choice made by SERM to completely abandon its regulatory role in drinking water in the fall of 1999, did not completely come to pass was not due to any actions on its part, but rather to the opposition of the Department of Health and the Department of Municipal and Cultural Affairs.

46. The lack of inspection by SERM of the North Battleford surface water treatment plant for ten years prior to 2001 had a direct bearing on the events of April, 2001. Had regular inspections by knowledgeable personnel been carried out in this period of time, the deficiencies in the plant's processes and operating procedures identified following April, 2001, probably would have, and in any event should have, been identified and addressed prior to April, 2001.

47. SERM was aware that its withdrawal from compliance activities would have adverse consequences for safe drinking water, and regarded mandatory certification of operators as a means to ensure some competence in water and wastewater treatment at the local level.

48. That the responsibility for implementing the CDI rests with three or more entities, with separate budgets, and separate priorities, is considered a serious weakness in the implementation strategy.

49. The CDI does not identify what its monitoring and compliance program will consist of to conduct inspections on municipal/public water facilities. To the extent the monitoring and compliance program is intended to "ensure a comprehensive water quality program at all facilities," the financial resources committed to the program to date will not accomplish this.

50. The bacteriological response protocol which arose out of the Cabinet Information Item in June, 2000, and the Cabinet Decision Item which followed in November, 2000, was a very positive step, and an effective one in increasing the amount of municipal compliance with bacteriological sampling. However, it must be regarded as a minimum response in terms of resources devoted to quality drinking water in this province.

51. The September, 1994, certification program review conducted by the certification advisory committee notified SERM that operators of water treatment plants in the province were, for the most part, poorly trained. SERM was also informed that one-half of all operators currently working in Saskatchewan had attended one or no workshops during their working careers.

52. Information was available to SERM that, had it chosen to inquire, would have demonstrated operators of the plants department in North Battleford were not participating in ongoing education related to water treatment.

53. SERM's assumption that operators receiving copies of its quarterly publication entitled *The Clear Water*

Reporter were reading and understanding articles dealing with water treatment published therein was wrong.

54. Industry publications are no doubt useful and valuable sources of information, but are not an effective means of communicating important information to operators of water treatment plants.

55. The mandatory certification program is a positive step to improving the quality of drinking water in the province.

56. With the low certification requirements for small system operators, and the borderline requirements for Class I and II operators, a continuing education component is necessary. North Battleford shows the voluntary approach to continuing education has not worked in the past, and there is no reason to believe it will in the future.

57. An amendment to the regulations requiring a certain number of continuing education credits in order to be eligible for renewal certification will not only be a positive influence on operators, it will also put municipalities on notice that the requirement is non-discretionary and is a cost of operating the water treatment plant.

58. A necessary corollary of making continuing education credits mandatory, is making available the programs that will allow operators to qualify for such credits.

59. That the current risk-based model employed by SERM since 1996 is arrived at on the basis of economics (what it or the government thinks it can afford among other priorities), and has nothing to do with how best to safeguard the health of the population, all of whom consume water.

60. As presently structured, SERM is an inadequate and ineffective regulator of drinking water.

61. SERM is well aware of what it takes to produce safe drinking water, including watershed management and protection of ground water sources, but the government of Saskatchewan has not provided it with a mandate to pursue an implementation strategy.

PART IX - SUMMARY OF RECOMMENDATIONS

1. That the criteria for surface water treatment plants reporting to SERM be standardized for the province, and not differ between EcoRegions.

2. That the City of North Battleford commence construction for a new sewage treatment plant at a location downstream from the surface water treatment plant by no later than the spring of 2003.

3. Each permit to operate a surface water treatment plant should require as a condition to operate that there exist a quality control/quality assurance written policy in place that is acceptable to the regulator.

4. That each permit to operate a surface water treatment plant specify as a condition for operation the record system that shall be maintained within the plant, and also specify a monthly internal review process to ensure that operating parameters within the permit are consistently being met.

5. That the City of North Battleford prepare a written safe drinking water policy that commits to the principle of quality of water over quantity of water, that commits to maintaining best industry practices in its water treatment plants, and that encourages the manager of the water treatment plant to report directly to city council whenever he has concerns that affect the safety of drinking water which are not being addressed by city administration officials.

6. That one of the committees of city council be assigned responsibility for implementing the city's safe drinking water policy.

7. That this committee receive from the manager of the water treatment plant a written report quarterly on the

operations of the water treatment plant during the previous three months. Said report should include the results of all sampling conducted during the period, any non-compliances with the operating permit, and any other types of problem that an oversight committee would be interested in hearing.

8. That the subcommittee of council prepare a report annually for city council on the state of drinking water in the city, which report shall be part of the public record.

9. That the City of North Battleford raise its water utility rates at least to the median level of the rates charged by the 13 Saskatchewan cities.

10. That in the future the performance requirements expected of a surface water treatment plant be itemized in its permit to operate, and include not only the parameters to be met, but also the quality assurance and quality control procedures that are to be in place.

11. To better ensure that surface water treatment plants remain capable in both infrastructure and operations year after year, that they be inspected by the regulator at least biannually by a person knowledgeable in surface water treatment best industry practices. This inspection should include: a record review to determine the level of compliance with the parameters for performance and sampling requirements set out in the permit; a review of the plant's processes and their operational effectiveness; an interview with the manager; and an interview with at least one operator.

    (a) That a detailed inspection report be produced that records any non-compliance with permit requirements, recommends any improvements to be made and a timetable for the same, and offers an overall grading of where the plant fits in the spectrum of quality for surface water treatment plants.

(b) That a copy of the inspection report be delivered to the manager of the plant, to the city commissioner or his or her equivalent, and to the medical health officer for the health district.

12. That the City of North Battleford in the next six months:

(a) install a supervisory control and data acquisition system (SCADA) in the surface water treatment plant;

(b) retain a management consultant to assess the adequacy of the management component and the operator component of the plants department and to report within a further two months. It is recommended the report produced be tabled at city council as a public document, and a copy provided to SERM; and

(c) commission an engineering study to determine if the city's reservoir capacity is adequate, bearing in mind the desirable goal of not operating the surface water treatment plant for short periods of time only.

13. That the Government of Saskatchewan approve SERM's request to fund an integrated provincial water quality database in the fiscal year 2002-03.

14. That the new data system incorporate the permit requirements for each licensee with a flagging system to identify communities that have not submitted the required samples and produce a printout on a weekly basis of all such non-compliances.

(a) That all non-compliances be followed up, within seven days, with the chief municipal administrator or his or her designate, who may not be the manager or other person operating the water treatment facility.

(b) That with respect to a missed bacteriological sample, the municipality be advised to submit one within seven days. In the event the municipality fails to do so a PDWA be issued.

15. That in the event of persistent non-compliance by a municipality with respect to bacteriological sampling requirements, the regulator should appoint new management (see page 288), or should rescind the permit to operate the facility.

16. That a provincial protocol for water-borne disease investigation be prepared, distributed, and adopted by all health districts in the province and that this protocol include:

(a) the establishment of a task force in each district which is to be notified by the medical health officer, or in his/her absence a public health inspector, whenever the health district is experiencing an enteric disease outbreak that could be caused by a water-borne pathogen;

(b) that this protocol emphasize that the first hypothesis to be tested is whether or not it could be a water-borne pathogen, which means automatically checking with personnel at the water treatment facilities and with the regulator who should have a member on the task force;

(c) when cases appear which are geographically close to a regional centre such as North Battleford that any additional persons or family members identified by the confirmed case who have also experienced a similar illness be interviewed in detail as to when and where they have consumed water for the period of at least ten days before the onset of illness;

(d) that if the enteric disease reporting form is to continue to be used as a routine form, a new, much more detailed, form be available for use by investigators whenever the investigation involves a possible outbreak of water-borne disease; and

(e) when in any health district there is a difference of opinion or uncertainty based on the available evidence as to whether or not a PDWA or boil water order should be issued after consultation with the task force, the medical health officer should contact forthwith the provincial public health officer or deputy minister to seek advice.

17. That each health district establish sentinel pharmacies to report any increase in anti-diarreal medications. This is recommended by the Centres for Disease Control and Prevention in Atlanta, Georgia, and seems necessary when so many patients experiencing enteric disease self-medicate. This alert can also result in a request to physicians to increase stool sampling.

18. That a provincial protocol be developed for use by all health districts as to when stool samples should be requested from a patient and forwarded to a laboratory. The inquiry did not hear enough medical evidence to determine what such protocol should be, but clearly in this case there were not enough stool samples taken and the ability to diagnose disease was hampered.

19. That the provincial Department of Health prepare for distribution to all health districts guidelines, including sample documents where appropriate, for all action to be taken by a health district once a PDWA or a boil water order is issued. The guidelines should cover the

points outlined in the memorandum dated October 2, 2000 prepared by the public health inspectors. (See page 190)

20. That each health district put in place a system that requires:

    (a) that all reports from laboratories identifying enteric disease be reviewed daily between Monday and Friday, whether the communicable disease coordinator is present at work or not;

    (b) that instances of enteric disease be recorded in the communicable diseases log on the date the result is submitted, not the date a person recorded it;

    (c) that one public health inspector assume the primary role for investigating enteric disease, with a designated alternate for when the primary investigator is not available;

    (d) that the primary and alternate investigator receive training additional to other public health inspectors in the investigation of enteric disease, and in particular in interviewing techniques; and

    (e) that each district establish a contingency plan that will mobilize a number of additional persons to the investigation team in the event of an outbreak. The logical persons to be so added would be public health nurses who also have some training in interviewing techniques.

21. That public health officers for the health districts be briefed annually by a SERM representative for the purpose of learning the state of water treatment systems in the district, and what the potential may be for problems that might lead to disease.

22. That the provincial government take steps to ensure a better supply of public health inspectors in the province of Saskatchewan. These steps should include either greater educational opportunity for persons wishing to become public health inspectors to be educated in the province, or financial assistance for those persons who must leave the province to obtain the appropriate education.

23. That in the future, if SERM wishes to bring to the attention of operators information it considers important, it do so by letter or bulletin, stating the information and why it is important.

24. That the government amend the operator certification regulations to provide that, after the first renewal, each operator must take a certain number of continuing education credits to qualify for the second renewal, and each renewal thereafter.

25. That the government ensure there are sufficient continuing education courses available to meet the needs of operator continuing education.

26. That EMPA be amended to:

    (a) establish a separate drinking water quality unit in SERM, whether it is a called a branch, a directorate, or a section, with its own "director";

    (b) provide the unit with all of the jurisdiction EMPA currently provides SERM over waterworks and, in addition, provide the unit with a mandate and jurisdiction to protect watershed and ground water sources of drinking water;

    (c) provide that within the unit there exist a separate compliance section; and

(d) provide that the unit produce an annual report to the legislature on the state of drinking water quality in the province.

27. That the regulator pursue a comprehensive inspection policy of water treatment facilities and apply a rigorous abatement-enforcement compliance policy on all water treatment facilities.

28. That *The Water Pollution Control and Waterworks Amendment Regulations* be amended:

(a) to provide that in the event of persistent non-compliance by a municipality, the regulator may order the replacement of the existing management or operators and may temporarily hire replacements as required at the municipality's expense; and

(b) to make it an offence to knowingly operate a water treatment facility in contravention of the operational requirements set out in the operating permit.

4

Appendix A

The Process of the Inquiry

1. General

When the North Battleford Water Inquiry was ordered on May 10, 2001, the Walkerton Inquiry was well underway. Valuable time was saved in avoiding pitfalls and in designing a fair, efficient, and thorough process by reviewing the practices and procedures that had been adopted in Walkerton. In particular, commission counsel and I were greatly assisted by early discussions with The Honourable Dennis R. O'Connor, Commissioner to the Walkerton Inquiry, and members of his able legal team who were generous in their time and advice in the early stages of this inquiry. The Walkerton experience was particularly helpful when it came to the design and management of our data system and the development of rules of procedure.

2. Mandate

The mandate of this inquiry was to uncover why a significant number of people became ill from cryptosporidiosis in the spring of 2001 in North Battleford, to review the adequacy and effectiveness of actions taken by civic, health, and government officials in response to the contamination, and to gauge what effect, if any, the relevant regulatory regime might have had upon the contamination itself as well as the official response to it.

The terms of reference did not extend to the general safety of the drinking water system in the Province of Saskatchewan. Nevertheless, in view of the widespread and continuing concerns about water safety that have arisen in recent years (and there was much evidence at the inquiry to suggest serious problems and concerns throughout Saskatchewan), I decided the report should be framed in a way that would allow any general themes and lessons inherent in the specifics of the North Battleford situation to emerge for the benefit of anyone able to make use of them, and my findings and recommendations are made with this in mind.

3. Practice and Procedure

The guiding principles and objectives of the inquiry were embodied in the inquiry's rules of practice and procedure, which were published June 18,

2001. The rules of practice and procedure dealt with such matters as standing before the inquiry, the gathering and presentation of evidence, the rights of witnesses, the order of examination of witnesses, access to evidence, and other matters of relevance, a copy of which rules are attached hereto.

4. Standing

The Public Inquiries Act of Saskatchewan c. P-38 does not stipulate who should have standing and participation rights at a commission of inquiry. The terms of reference of the inquiry authorized me to set such rules of practice and procedure as I deemed appropriate. In establishing the rules for standing, which were set out in Section II of the rules of practice and procedure, I was mindful of legal precedents as well as the need to hear from a variety of interests and perspectives relevant to the inquiry's mandate.

Standing was granted to parties who would be "directly and substantially affected by the inquiry." This group included:

(a) The City of North Battleford;

(b) The Battlefords District Health Board;

(c) The Government of Saskatchewan as represented by:

  (i) Saskatchewan Environment and Resource Management;

  (ii) Saskatchewan Health;

  (iii) Saskatchewan Municipal Affairs and Housing; and

  (iv) Saskatchewan Water Corporation.

(d) Dr. J. Gerhard Benadé, the Medical Health Officer for the Battlefords District Health Board at the time of the contamination;

(e) Dr. David Butler-Jones, Chief Medical Health Officer for the Province of Saskatchewan;

(f) Dr. Eric Young, Deputy Chief Medical Health Officer for the Province of Saskatchewan;

(g) Canadian Union of Public Employees, Local 287.

Standing was also granted to groups I felt represented "clearly ascertainable interests and perspectives" essential to the inquiry's mandate. This group included:

(a) The Association of Professional Engineers and Geoscientists of Saskatchewan;

(b) Saskatchewan Environmental Society, and Nature Saskatchewan; and

(c) A group of 407 individuals and corporations affected by the contaminated potable water in North Battleford.

Each of these parties was represented by legal counsel at the inquiry and the process greatly benefitted from the variety of interests and perspectives that each brought to the investigation and the public hearings.

I did not find it necessary to create separate categories of standing and relied upon the good judgment and co-operation of legal counsel to confine themselves in cross-examination to the perspectives related to their client's interest. This decision was vindicated by the lively and informative debate that characterized the hearings, but which nevertheless remained measured and proportional to the interest being represented.

5. Consequences of Standing

Those parties granted standing had the right to legal counsel and pursuant to the inquiry's rules of practice and procedure:

(a) Access to all documentation gathered by commission staff and entered onto the inquiry's database;

(b) Receipt in advance of documents that commission counsel proposed to introduce into evidence;

(c) Receipt in advance of statements of anticipated evidence prepared by commission counsel for each witness to be called at the public hearings;

(d) The right to cross examine witnesses on matters relevant to their client's interest;

(e) The right to suggest witnesses to be called by commission counsel and to suggest evidence that commission counsel should try to obtain;

(f) The right to make a closing submission before the commission.

All witnesses called by the inquiry had the right to be represented by counsel and to have counsel present when they were being interviewed by commission counsel for purposes of preparing statements of anticipated evidence.

6. Funding

The terms of reference of the inquiry provided as follows:

> The Commission shall determine applications by those parties, if any, or those witnesses, if any, to the public inquiry that apply to the Commission to have their legal counsel paid for by the Commission and further determine at what rate such counsel shall be paid for their services.

Parties who requested funding were required to demonstrate how they satisfied the criteria for funding set out in the rules of practice and procedure. They also had to provide financial statements and operating budgets and describe their respective fee structures. In addition, they had to include a description of the purposes for which the funds were required and how those funds would be disbursed and accounted for.

To be considered for funding the applicant, first of all, had to obtain standing before the inquiry and, among other things, show a clearly ascertainable interest that ought to be represented at the inquiry and an established record of concern for, and a demonstrated commitment to, the interest it wished to represent.

Applications for funding were heard immediately following applications for standing. The following parties were granted funding:

(a) The City of North Battleford;

(b) Saskatchewan Environmental Society, and Nature Saskatchewan;

(c) Canadian Union of Public Employees, Local 287;

(d) A group of 407 individuals and corporations affected by the contaminated potable water in North Battleford.

Counsel fees for those parties granted funding were based upon one hour of preparation for each hour of Hearing. Disbursements were allowed on the Saskatchewan Government Employee tariff. The hourly rates set for counsel were based on counsel's experience with a maximum of $192 per hour.

7. The Collection of Evidence

The Public Inquiries Act grants to a commission of inquiry the power to summon witnesses to give evidence on oath or on solemn affirmation and to produce such documents and things as are required for a full investigation of the matters for which the inquiry is called.

In addition, the *Act* also grants the same power to enforce the attendance of witnesses and to compel them to give evidence as is invested in a court of record in civil cases.

Pursuant to the *Act*, the order-in-council establishing the inquiry directed all departments, agencies, and crown corporations of the Government of Saskatchewan to assist the Commission to the fullest extent so that the Commission could carry out its duties.

In exercise of these powers, many witnesses were interviewed as part of the investigative phase of the inquiry (not all of whom were called) and thousands of documents were gathered from various sources. In particular, the government of Saskatchewan and its relevant departments, the City of North Battleford, and the Battlefords District Health Board produced a large quantity of helpful documents. The responsibility for interviewing witnesses, reviewing documents, and gathering evidence fell to commission counsel. Most of the documents gathered by commission counsel were scanned into the inquiry's database so that they could be accessed and marshalled more quickly. Upon signing undertakings of confidentiality, parties with standing and their counsel received advance copies of documentation that commission counsel intended to use with each witness.

One of the conditions of being granted standing before the inquiry was that all parties and their counsel were deemed to undertake to adhere to the rules of practice and procedure established by the inquiry. One of these rules was that parties with standing had to provide to commission counsel the names and addresses of all witnesses they felt ought to be heard and copies of all relevant documentation at the earliest opportunity. Hence, participation in the inquiry meant giving commission counsel access to all relevant witnesses and documents.

A large quantity of documentation was produced that commission staff had to review, and thereafter conduct appropriate investigations and interviews, to determine the evidence that would be led at the inquiry. Because part of the mandate was to gauge the effect, if any, of any regulations, by-laws, policies, guidelines, procedures, and practices of or applicable to the Government of Saskatchewan, the Battlefords Health District, and the City of North Battleford on the contamination events, a large number of documents inevitably came from these three parties. Commission counsel were given significant assistance, not only by counsel representing these parties, but by individual employees and officials who, for the most, put themselves wholeheartedly behind the inquiry process.

Early in the investigative stage, the Government of Saskatchewan indicated that it reserved the right to assert a claim of privilege over certain government documents. In the end, no such claim of privilege was ever asserted and no conflict arose between commission counsel wanting to put documents into evidence and an assertion of privilege by the government.

All parties completed certificates of production executed by senior officials that full disclosure of documentation had been made to the inquiry. I am satisfied that the inquiry obtained the documentation necessary not only to assess the circumstances of the cryptosporidiosis outbreak, but to thoroughly review civic, health, and provincial government policies, procedures, and practices in accordance with the terms of the inquiry's mandate.

It was the responsibility of commission counsel to ensure that all issues relevant to the inquiry's mandate were brought to my attention and to generally represent the public interest during the inquiry process. Hence, commission counsel played the primary role in investigating the contamination event of 2001, identifying witnesses, and obtaining and organizing the relevant documentary evidence. In doing this, commission counsel were greatly assisted by the co-operation of the parties with standing and their own legal counsel. The inquiry could not have completed its mandate in the time available without the close co-operation that occurred between all legal counsel involved, and I wish to commend them for their success in this regard.

8. The Hearings

The inquiry heard oral testimony from 32 witnesses and received 120 exhibits, many of which consisted of a binder of documents, over 33 days of hearings. The inquiry concluded with final submissions on January 14 and 15, 2002.

The subject matter of the inquiry made it essential that the hearings be held in public and, in my view, in North Battleford, because of that community's immediate primary interest in the matters to be inquired into. The hearings were held in a portion of the convention facilities in a local hotel in North Battleford.

Recognizing that it is often difficult for interested parties to attend in person to hear evidence, and taking a cue from the Walkerton hearings that had been televised locally on cable television, arrangements were made to have the local cable television operator in North Battleford provide coverage of the hearings. I wish to thank the local cable television operator for its co-operation in this respect. Anecdotal evidence suggests the viewership of the hearings via this medium was substantial.

To assist further in making the whole process transparent and accessible to interested parties, the inquiry acquired its own website (www.northbattlefordwaterinquiry.ca) where it posted procedural advice and materials, schedules of witnesses and the dates they would appear, and daily transcripts of the proceedings. A full transcript of the oral testimony was available for posting on the website within a matter of hours following the close of proceedings on each day.

An independent and impartial inquiry is not always a comfortable experience for witnesses who, on occasion, may have to face days of questioning and potential threats to their privacy, personal reputations, and legal interests. I was most impressed by all of the witnesses who appeared in North Battleford to give evidence and who did so, with few exceptions, in a forthright and public-spirited manner. Many of them travelled long distances to do this, but those witnesses who lived locally faced what was perhaps the greater strain of being open and helpful in a situation where their neighbours and acquaintances might well judge them harshly with the false omniscience born of hindsight. They are to be commended for the way in which they handled this difficult challenge. All legal counsel who participated in the inquiry were both astute and co-operative in ensuring that the correct balance was achieved between the needs of the inquiry and interests and rights of individual witnesses.

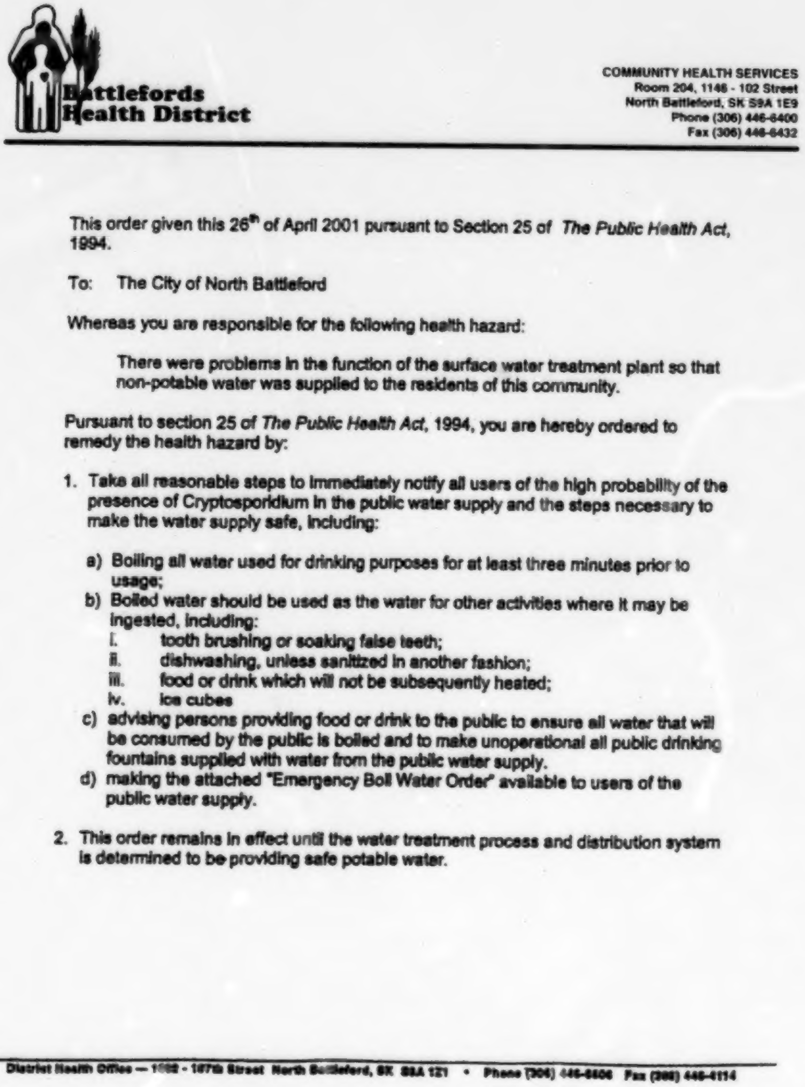
9. Closing Arguments

Standing for a party included the right to present closing arguments to the inquiry and, indeed, I regarded this as necessary to assist me in identifying the different points of view represented by the parties at the Hearing. Commission counsel's role in representing the public interest in an impartial manner meant that I did not request closing arguments from him.

Written submissions were submitted several days in advance of the oral presentations and were circulated to each counsel concerned so that, if necessary, a response could be formulated to another party's submission. In addition, following oral presentations, each counsel was given the right to respond to any matter that involved its interest or perspective.

The inquiry concluded hearings on January 15, 2002.

Appendix B - Boil Water Order - April 26, 2001



Battlefords
Health District

COMMUNITY HEALTH SERVICES
Room 204, 1146 - 102 Street
North Battleford, SK S9A 1E9
Phone (306) 446-6400
Fax (306) 446-6432

This order given this 26th of April 2001 pursuant to Section 25 of *The Public Health Act, 1994*.

To: The City of North Battleford

Whereas you are responsible for the following health hazard:

> There were problems in the function of the surface water treatment plant so that non-potable water was supplied to the residents of this community.

Pursuant to section 25 of *The Public Health Act*, 1994, you are hereby ordered to remedy the health hazard by:

1. Take all reasonable steps to immediately notify all users of the high probability of the presence of Cryptosporidium in the public water supply and the steps necessary to make the water supply safe, including:
   a) Boiling all water used for drinking purposes for at least three minutes prior to usage;
   b) Boiled water should be used as the water for other activities where it may be ingested, including:
      i. tooth brushing or soaking false teeth;
      ii. dishwashing, unless sanitized in another fashion;
      iii. food or drink which will not be subsequently heated;
      iv. ice cubes
   c) advising persons providing food or drink to the public to ensure all water that will be consumed by the public is boiled and to make unoperational all public drinking fountains supplied with water from the public water supply.
   d) making the attached "Emergency Boil Water Order" available to users of the public water supply.
2. This order remains in effect until the water treatment process and distribution system is determined to be providing safe potable water.

You may appeal this order in accordance with Section 11 of the Public Health Appeals Regulations (an excerpt of the regulations, pages 5 – 10, attached). Address for service of appeal is:

Battlefords District Health Board
1092 – 107th Street
North Battleford, SK S9A 1Z1
Attention: John Yarske, CEO

Dr. Gerhard Benadé
Medical Health Officer

c.c. John Yarske, CEO, Battlefords Health District
Lee Hall, Director of Community Health Services
Scott Meekma, SERM, North Battleford
Dr. David Butler-Jones, Chief Medical Officer of Health, Saskatchewan Health

Appendix C - Protocol for Removing Boil Water Order

PROTOCOL FOR REMOVING BOIL WATER ORDER
City of North Battleford

Rationale

Six criteria must be satisfied prior to the removal of the Boil Water Order (BWO) for the City of North Battleford.

1. ***Safe Surface Water.*** The surface water treatment plant (SWTP) must be producing microbiologically safe drinking water.
2. ***Safe Ground Water.*** The ground water supply must be confirmed not to be under the direct influence of surface water, and ground water being directed to the municipal distribution system (MDS) must be microbiologically safe.
3. ***Flushing.*** The MDS must be flushed with microbiologically safe drinking water, with all water in the MDS (including storage facilities) being replaced with safe drinking water during the flushing process.
4. ***Illness Stabilization.*** The current waterborne disease outbreak is assessed as over by a written statement from the Medical Health Officer.
5. ***Safe Operations.*** Procedures for the operation and maintenance of primary water treatment components must be developed and formally implemented, and all operators must be made aware of these procedures.
6. ***Monitoring.*** Monitoring of the treated water in the MDS must conclusively demonstrate its microbiological safety.

General

(a) Samples must be collected and shipped in accordance with the protocols recommended by the laboratory analyzing the samples.

(b) This protocol expires upon the rescinding of the current Boil Water Order. Long term water system issues will be addressed in a revised Ministers Order for the City of North Battleford's water system to be issued by Saskatchewan Environment and Resource Management (SERM).

(c) City of North Battleford to submit a transitional management plan for the continued safe operation of the waterworks, acceptable to SERM until such time as a revised Minister's Order is in place.

(d) The City of North Battleford's transitional management plan for the operation of the waterworks to be acceptable to the Battlefords Health District.

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Boil Water Order Removal Criteria

1(a) **Surface Water Treatment Plant**

The safety of the surface water supply can be demonstrated by turbidity, free and total chlorine residuals, total coliform and fecal coliform levels which meet SERM's objectives/regulations for safe drinking water. The water must also be free *Cryptosporidium* and *Giardia* organisms. This must be demonstrated by sampling according to the attached sampling schedule.

Continuous turbidity monitoring recorded hourly during plant operation. Hourly readings of the effluent directed to clear well from filter banks 1&2 as well as 3&4 must be less than 0.30 NTU for 12 consecutive hours over the operating day and at no time greater than 1.0 NTU for the 2 week period prior to rescinding the EBWO.

1(b) **Sewage Treatment Plant Facility**

A plan must be submitted by the City of North Battleford and approved by SERM's Manager, Environmental Protection, Parkland EcoRegion for a contingency plan to address sewage treatment plant bypasses. Considerations will include bypass disinfection, surface water treatment plant intake shutdown and spill notification to SERM's Spill Control number.

2. **Ground Water Treatment Facility**

The safety of the ground water supplies can be demonstrated by free and total chlorine residuals, total coliform and fecal coliform levels which meet SERM's objectives/regulations for safe drinking water. The water must also be free of *E. coli*, *Cryptosporidium* and *Giardia* organisms. This should be demonstrated by sampling and testing according to the attached sampling schedule.

A written opinion from a professional engineer respecting the potential for direct influence of cryptosporidium and Giardia from North Saskatchewan river water must be provided by the City.

3 (a) **Distribution System & Reservoirs Flushing**

Adequate flushing, which includes all dead end water mains and storage reservoirs, can be demonstrated by a minimum 50% increase in background concentrations of free chlorine to a maximum concentration of 1.5 mg/L in and no presence of bacteria in at least 15 representative locations in the MDS, as an indicator of a fully purged system; and a communications plan acceptable to SERM and the Battlefords Health District to notify all consumers to flush their plumbing systems (e.g., including all taps, shower connections, water softeners, water heaters, point of entry and point of use water treatment devices, etc.).

Reservoirs will be cleaned in accordance with the consultant's recommendations.

3 (b) Post - Flushing Monitoring

Parameters and results are as follows: turbidity, free and total chlorine residuals, total coliform and fecal coliform levels which meet SERM's objectives/regulations for safe drinking water. The water must also be free of *E. coli*, viable *Cryptosporidium* and viable *Giardia* organisms. Each of these samples must be collected from representative locations in the MDS as per a plan submitted on behalf of the City of North Battleford and approved by SERM's Manager, Environmental Protection, Parkland EcoRegion. Results must be acceptable based on the collection of at least 3 consecutive samples taken no less than daily following the demonstration of a successful flushing program.

4. Illness Stabilization

The current waterborne disease outbreak is assessed as over by a written statement from the Medical Health Officer.

5. Safe Operations

Safe operations can be demonstrated by the provision to SERM's Manager, Environmental Protection, Parkland EcoRegion a written declaration from the City of North Battleford, that all water treatment plant operators have been made aware of procedures for the safe operation and maintenance of primary water treatment plant components, and that the procedures have been formally implemented (including a copy of the procedures document which must be approved by SERM's Manager, Environmental Protection, Parkland EcoRegion); and a written commitment by the City of North Battleford to SERM's Manager, Environmental Protection, Parkland EcoRegion that a certified operator will be in charge of North Battleford's water treatment facilities.

The City will require a qualified water and wastewater manager who will assume the responsible overseeing of all the operations (water and wastewater treatment) to ensure drinking water safety at all times.

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On behalf of Saskatchewan Environment
and Resource Management
Mark Getzlaf, P.Eng.,
Manager, Environmental Protection
Parkland EcoRegion

On behalf of the Battleford's Health District
Dr. Shauna Hudson, MHO

On behalf of the City of North Battleford
Mayor Wayne Ray

On Behalf of Saskatchewan Health
Dr. Butler-Jones

Dated: ________________________, 2001.

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Sampling Protocol for Rescinding The North Battleford Emergency Boil Water Order

Location & Timing	**Sample Type**	**Frequency**
Surface Water Treatment Plant - Treated water, pre-flushing	Cryptosporidium & Giardia	5 consecutive samples at each filter bank = 10 samples
Surface Water Treatment Plant - Treated Water, pre-flushing	Chlorine Residual	Hourly during plant operations in clear-well
Surface Water Treatment Plant - Treated Water, pre-flushing	Bacteriological	daily in clear-well
Ground Water Plant, pre-flushing	Cryptosporidium & Giardia	3 consecutive samples of final treated water
Surface Water Treatment Plant - Treated Water, pre and post-flushing	Turbidity	Recorded hourly from effluent representative of filter banks 1&2 and 3&4
Distribution System, post-flushing	Cryptosporidium & Giardia	3 consecutive samples at 5 locations throughout distribution system = 15 samples
Distribution System, post-flushing, final day of Crypto sampling	Free Chlorine & bacteriological	15 locations throughout the distribution system

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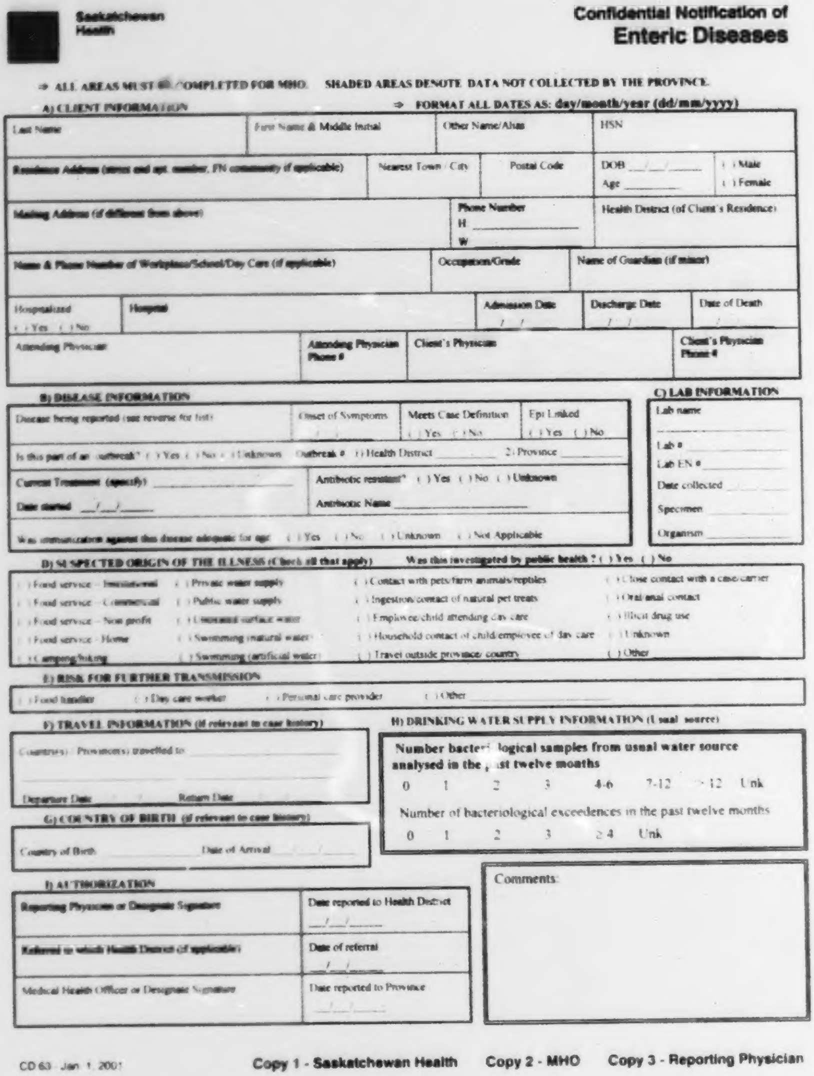
Appendix D - Confidential Notification of Enteric Diseases Form



Saskatchewan
Health

Confidential Notification of
Enteric Diseases

⇒ ALL AREAS MUST BE COMPLETED FOR MHO. SHADED AREAS DENOTE DATA NOT COLLECTED BY THE PROVINCE.

A) CLIENT INFORMATION ⇒ FORMAT ALL DATES AS: **day/month/year (dd/mm/yyyy)**

Last Name	First Name & Middle Initial	Other Name/Alias	HSN	
Residence Address (street and apt. number, FN community if applicable)	Nearest Town / City	Postal Code	DOB __/__/____ Age ______	( ) Male ( ) Female
Mailing Address (if different from above)	**Phone Number** H ________ W	Health District (of Client's Residence)		
Name & Phone Number of Workplace/School/Day Care (if applicable)	**Occupation/Grade**	**Name of Guardian (if minor)**		
Hospitalized ( ) Yes ( ) No	**Hospital**	**Admission Date** / /	**Discharge Date** / /	Date of Death / /
Attending Physician	**Attending Physician Phone #**	**Client's Physician**	**Client's Physician Phone #**	

B) DISEASE INFORMATION

Disease being reported (see reverse for list)	Onset of Symptoms / /	Meets Case Definition ( ) Yes ( ) No	Epi Linked ( ) Yes ( ) No

Is this part of an outbreak? ( ) Yes ( ) No ( ) Unknown **Outbreak #** 1) Health District ________ 2) Province ________

Current Treatment (specify) ____________
Date started __/__/____
Antibiotic resistant? ( ) Yes ( ) No ( ) Unknown
Antibiotic Name ____________

Was immunization against this disease adequate for age ( ) Yes ( ) No ( ) Unknown ( ) Not Applicable

C) LAB INFORMATION

Lab name ________
Lab # ________
Lab EN # ________
Date collected ________
Specimen ________
Organism ________

D) SUSPECTED ORIGIN OF THE ILLNESS (Check all that apply) **Was this investigated by public health ?** ( ) Yes ( ) No

( ) Food service – Institutional
( ) Food service – Commercial
( ) Food service – Non profit
( ) Food service - Home
( ) Camping/hiking
( ) Private water supply
( ) Public water supply
( ) Untreated surface water
( ) Swimming (natural water)
( ) Swimming (artificial water)
( ) Contact with pets/farm animals/reptiles
( ) Ingestion/contact of natural pet treats
( ) Employee/child attending day care
( ) Household contact of child/employee of day care
( ) Travel outside province/ country
( ) Close contact with a case/carrier
( ) Oral/anal contact
( ) Illicit drug use
( ) Unknown
( ) Other

E) RISK FOR FURTHER TRANSMISSION

( ) Food handler ( ) Day care worker ( ) Personal care provider ( ) Other ____________

F) TRAVEL INFORMATION (if relevant to case history)

Country(ies) / Province(s) travelled to ____________
Departure Date / / Return Date / /

G) COUNTRY OF BIRTH (if relevant to case history)

Country of Birth ________ Date of Arrival __/__/____

H) DRINKING WATER SUPPLY INFORMATION (Usual source)

Number bacteriological samples from usual water source analysed in the past twelve months

0 1 2 3 4-6 7-12 >12 Unk

Number of bacteriological exceedences in the past twelve months

0 1 2 3 ≥4 Unk

I) AUTHORIZATION

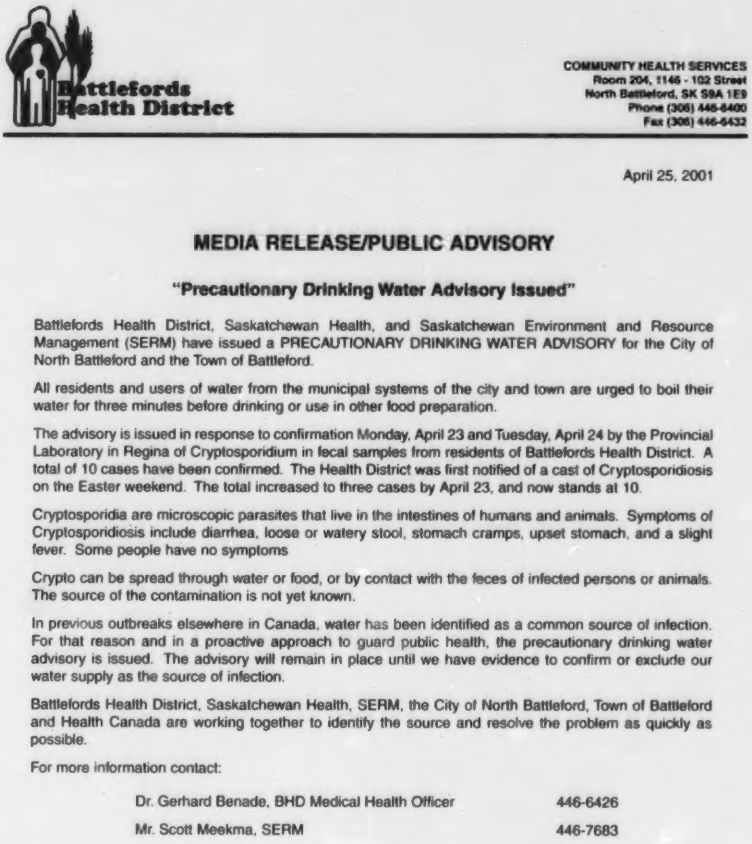
Reporting Physician or Designate Signature	Date reported to Health District __/__/____
Referred to which Health District (if applicable)	Date of referral __/__/____
Medical Health Officer or Designate Signature	Date reported to Province __/__/____

Comments:

CD 63 - Jan. 1, 2001

Copy 1 - Saskatchewan Health **Copy 2 - MHO** **Copy 3 - Reporting Physician**

Appendix E - Precautionary Drinking Water Advisory - April 25, 2001



Battlefords
Health District

COMMUNITY HEALTH SERVICES
Room 204, 1146 - 102 Street
North Battleford, SK S9A 1E9
Phone (306) 446-6400
Fax (306) 446-6432

April 25, 2001

MEDIA RELEASE/PUBLIC ADVISORY

"Precautionary Drinking Water Advisory Issued"

Battlefords Health District, Saskatchewan Health, and Saskatchewan Environment and Resource Management (SERM) have issued a PRECAUTIONARY DRINKING WATER ADVISORY for the City of North Battleford and the Town of Battleford.

All residents and users of water from the municipal systems of the city and town are urged to boil their water for three minutes before drinking or use in other food preparation.

The advisory is issued in response to confirmation Monday, April 23 and Tuesday, April 24 by the Provincial Laboratory in Regina of Cryptosporidium in fecal samples from residents of Battlefords Health District. A total of 10 cases have been confirmed. The Health District was first notified of a cast of Cryptosporidiosis on the Easter weekend. The total increased to three cases by April 23, and now stands at 10.

Cryptosporidia are microscopic parasites that live in the intestines of humans and animals. Symptoms of Cryptosporidiosis include diarrhea, loose or watery stool, stomach cramps, upset stomach, and a slight fever. Some people have no symptoms

Crypto can be spread through water or food, or by contact with the feces of infected persons or animals. The source of the contamination is not yet known.

In previous outbreaks elsewhere in Canada, water has been identified as a common source of infection. For that reason and in a proactive approach to guard public health, the precautionary drinking water advisory is issued. The advisory will remain in place until we have evidence to confirm or exclude our water supply as the source of infection.

Battlefords Health District, Saskatchewan Health, SERM, the City of North Battleford, Town of Battleford and Health Canada are working together to identify the source and resolve the problem as quickly as possible.

For more information contact:

Dr. Gerhard Benade, BHD Medical Health Officer	446-6426
Mr. Scott Meekma, SERM	446-7683

FACT SHEET ON CRYPTOSPORIDIOSIS

Cryptosporidiosis is the disease often called "crypto" caused by the parasite cryptosporidium parvum.

Cryptosporidium infections can be caused by swallowing only a small amount of cryptosporidia through contaminated water or food. It can be spread through fecal-oral transmission by feces of an infected person or an object that has been contaminated with the infected person's feces. The illness that results is an infection of the bowel. The first symptoms may appear 2 - 10 days after a person becomes infected and they will normally last for about 2 weeks or less although some individuals my recover then get worse again.

Not everyone who is infected will feel sick. If symptoms do occur they may include:

- watery diarrhea
- stomach cramps
- nausea
- vomiting and mild fever

Anyone can get Cryptosporidiosis. Those at greater risk are:

- People in close contact with children or adults who have cryptosporidiosis.
- People who drink open water from lakes, rivers or ponds that has not been properly treated.
- Children in child care centers.

There are no prescribed antibiotics for this illness but some medications can lessen the severity of the symptoms.

To prevent the infection:

- Drink or consume only boiled water. Water must be boiled for three minutes before use. Purchased bottled water may also be used. Do not drink water directly from lakes, rivers, streams or other such surface water supplies unless boiling the water first for three minutes.
- Use boiled water for drinking, brushing teeth, making ice, cooking food and washing dishes.
- Wash all fruits and vegetables before eating with boiled or bottled water. Drink only pasteurized milk and pasteurized apple cider. Do not eat unpasteurized milk products.
- Avoid swallowing water when bathing, showering, swimming, especially in pools, lakes, ponds or rivers. Avoid going to public pools if you have diarrhea.
- Maintain good personal hygiene and frequent hand washing.
- Wash hands thoroughly with warm soap and water after going to the washroom. Dry hands thoroughly as well.
- Wash hands thoroughly after changing diapers or whenever fecal soiling occurs.
- Wash your hands thoroughly after contact with pets.
- Disinfect dishes by washing in dishwashing machines that have a dry cycle or a final rinse that exceeds 113 F for 20 minutes or 122 F for five minutes or 162 F for 1 minute.
- Avoid sexual practices that may result in hand or mouth exposure to feces.
- Avoid direct exposure to cattle for other farm animals and if exposed wash your hands thoroughly immediately thereafter.

Most people with a healthy immune system will recover on their own. If you have diarrhea, drink plenty of fluids to prevent dehydration. If you have a severely weakened immune system, consult with your health care provider.

For more information contact:

Battlefords Health District Community Health Services at 446-6400

Saskatchewan Environment & Resource Management at 446-7683

CRYPTOSPORIDIUM - FREQUENTLY ASKED QUESTIONS

Q **What is Cryptosporidium and how is it transmitted?**

A Cryptosporidium is a microscopic parasite that is found in the feces of infected humans or animals. Humans are infected when they ingest contaminated water or food, or touch contaminated objects, then touch their mouth before washing their hands well. Cryptosporidiosis, the disease caused by Cryptosporidium, is a common cause of diarrhea among people with AIDS.

Q **What are the symptoms?**

A Symptoms of Cryptosporidium infection in persons with normal immune systems include diarrhea that lasts one or two weeks, often accompanied by abdominal cramps, fatigue, nausea, vomiting, and low-grade fever. People usually develop symptoms two to 10 days after ingesting the parasite.

In persons with weakened immune systems, Cryptosporidiosis can be chronic and life threatening.

Q **Who is at risk for severe Cryptosporidiosis?**

A People at risk for severe Cryptosporidiosis include people with AIDS, people who have cancer, or organ or bone marrow transplant patients who are taking drugs that suppress the immune system, and people who are born with genetically weakened immune systems.

Q **Why is Cryptosporidium a problem in drinking water?**

A Cryptosporidium is a problem because most water from lakes, rivers and streams contain some of the microscopic parasite. Most communities get their water from these "surface" sources rather than from underground sources such as wells. Cryptosporidium is highly resistant to chlorine and other disinfectants which are used to kill bacteria and viruses in drinking water. In addition, Cryptosporidium is so small that the type of filters used in conventional municipal water treatment does not easily remove it from the water.

Over half of the tested public water supplies that use surface water have been found to have small amounts of Cryptosporidium in the water sent to homes and businesses.

Q **How can I tell if there is Cryptosporidium in my drinking water?**

A You cannot tell without expensive, special tests. These tests are not very good for home use and are not always reliable.

Q **Is there a cure for Cryptosporidium infection?**

A No. Some drugs, such as paromomycin (Par-o-mo-my-sin) may reduce the symptoms of Cryptosporidiosis, but no drug now known can cure it. Diarrhea can cause dehydration. People with diarrhea should contact their health care provider who may recommend an oral rehydration therapy mix.

Q **Should I take extra protective measures?**

A It depends on your health and your drinking water. If you have AIDS, if you have cancer, or if you have had an organ or bone marrow transplant and are taking drugs that weaken your immune system, or if you were born with a genetically weakened immune system, you may want to take extra measures. You should talk to your health care provider regarding the level of your risk and on how to reduce it.

If you have a healthy immune system, you are at less risk for Cryptosporidiosis, but you may want to consider the quality of your drinking water. Unfortunately, assessing the risk of Cryptosporidium infection from your drinking water is not easy. Tests for Cryptosporidium in public water supplies are not easy to interpret. A positive test does not necessarily mean there is a risk, and a negative test does not necessarily mean there is no risk. If your drinking water comes from a surface source (lake, stream, river) that is unfiltered, or one that is located downstream from a sewage treatment facility or runoff from farming, your water may be at increased risk of containing Cryptosporidium.

Q **What can immuno-suppressed people do to avoid infection with Cryptosporidium?**

A Avoid sexual practices that may result in exposure to feces.
Avoid drinking water directly from lakes, rivers, ponds, or streams.
Avoid swimming in lakes, rivers, streams, ponds, public swimming pools or recreational parks.
Avoid working with diaper-aged children.
Avoid contact with feces of all animals, particularly young farm animals such as calves.
Always wash hands thoroughly:

- after any contact with animals;
- after any contact with soil (e.g. gardening);
- after changing diapers;
- before eating or preparing food.

Q **Do I need to buy bottled water?**

A No. Boiled tap water is safe. Bottled water is safe provided it is treated by reverse osmosis, distilled, or filtered through an absolute 1 micron or smaller filter.

Q **Can I take a shower or bath?**

A Yes, but avoid swallowing any water.

Q **Can I use ice cubes already frozen?**

A No. Discard all ice cubes because they may contain Cryptosporidium. Make new ice cubes with boiled, filtered or bottled water.

Q **Can I brush my teeth with tap water?**

A No. Use boiled, filtered or bottled water.

Q **Is drinking water the only source of the parasite that causes Cryptosporidiosis?**

A No, there are many other sources. For example, foods such as unwashed fruits and vegetables, especially from a foreign country, swimming pools, recreational water and pets are common sources. (day care centers, nursing homes mentioned)

Q **I have a filter on my tap. Is my water safe to drink?**

A Not all available home water filters remove Cryptosporidium. Look for labels that say:

Reverse osmosis treated
Filtered through an absolute 1 micron or smaller filter
1 micron absolute
NSF Standard 53 certified for cyst removal/reduction

Q **Is bottled water safe to drink?**

A See chart below.

Water processed by method effective against Cryptosporidium
Reverse Osmosis Treated
Filtered through an absolute 1 micron or smaller filter
Distilled
"1 micron absolute"

Appendix F - Water Management Framework

PROTECTION

Goal	Objective	Actions
A. Healthy Aquatic and Riparian Ecosystems and Drinking Water Sources.	1 Maintain, restore and protect the health of aquatic and riparian ecosystems and drinking water sources	1. Develop indicators and monitor the health of drinking water sources and aquatic ecosystems 2. Establish criteria on aquatic ecosystem integrity which can e used to meaningfully guide economic development activities 3. License works that modify flows in streams, giving due consideration to instream use 4. Ensure that aquatic ecosystems and riparian areas are considered in the Representative Areas Network 5. Review screening procedures and expand existing protocol regarding non-native plant and animal introductions into Saskatchewan 6. Develop policy for conserving riparian habitat on a watershed basis 7. Make decisions on proposals involving inter-basin transfer of water, taking into account potential effects on donor and receiving basins
	2 Minimize contamination of waterbodies	8. Promote more buffer strips and environmental reserves for activities such as forestry, mining and agriculture 9. Carry out additional field research and monitoring on the effects of pesticide, nutrient and sediment impacts, and develop strategies to reduce impacts 10. Develop and disseminate best management practice guidelines for livestock access to shorelines 11. Develop and implement best management practice guidelines to reduce impacts of urban runoff 12. Ensure adequate monitoring and enforcement of septic tank regulations
B. Safe and Sustainable Aquifers	3 Protect aquifers from depletion and contamination	13. Develop management plans including monitoring strategies for all major groundwater sources for domestic, municipal and industrial uses 14. Evaluate potential for use of municipal planning bylaws to provide added protection for aquifers

MANAGEMENT & DEVELOPMENT

Goal	Objective	Actions
C. Protection of Wetlands and Effective Control of Drainage	4 Foster wetlands retention and orderly drainage, in accordance with regulations and public policy	15. Pursue public and private economic incentives to encourage wetland retention by landowners 16. Establish interdepartmental Task Force to undertake public consultation, build on the findings of the Upper Assiniboine River Basin Study, and make specific recommendations to Cabinet on government's role in protecting wetlands and developing a new drainage policy 17. Develop and implement a wetlands conservation plan, consistent with Saskatchewan's Wetland Policy, following development of a wetlands inventory and monitoring program, prioritization, and development of a new drainage policy 18. Develop interagency enforcement strategy and change legislation to more effectively deal with unauthorized drainage 19. Clarify role and reporting function of the Water Appeal Board 20. Explore feasibility of introducing a conservation assessment on drainage to mitigate impacts and to develop and enhance wetlands
D. Access to a Safe and Reliable Supply of Drinking Water	5 Enhance safety of municipal and domestic drinking water supplies	21. Implement mandatory operator training and certification for water and wastewater operations 22. Review municipal water and wastewater treatment operations and monitoring practices and provide support and advice as appropriate 23. Enhance Rural Water Quality Advisory Service program and encourage regular use by rural residents 24. Facilitate development of municipal and regional water utilities where technically feasible and cost effective
E. Sustainable Economic Development	6 Promote water developments with broad public benefits	25. Evaluate existing financial and technical assistance programs to determine distribution of costs and environmental acceptability, and modify government contributions accordingly
	7 Promote economic diversification and stability through sustainable use of water and related land resources	26. Develop regional analyzes of the availability and quality of water supplies for economic development purposes 27. Support infrastructure for projects which provide significant benefits to the province, are environmentally sound, and are cost-shared based on projected derived benefits 28. Explore opportunities for increased development of the aquaculture industry 29. Continue to support new irrigation developments in accordance with *The Irrigation Act, 1996*
	8 Prevent bulk export of water	30. Develop legislation to strengthen current policy preventing bulk export of water

MANAGEMENT & DEVELOPMENT

Goal	Objective	Actions
F. Adequate Water Infrastructure	9 Establish innovative approaches for financing costs of developing, operating, maintaining and upgrading infrastructure	31. Establish a funding mechanism to support provincial water infrastructure 32. Encourage communities to establish user-fee based funds to support municipal water infrastructure 33. Strengthen existing programs and regulations to ensure on-going dam safety
G. Protection from Flood, Drought and Climate Change	10 Plan developments in consideration of the potential effects of flood, drought and climate change	34. Enhance flood forecasting capability and improve public access to flood forecasts 35. Review and modify criteria for approving projects subject to flooding for specific types of developments such as industrial and lakeshore residential 36. Establish a provincial working group, with federal and industry participation to develop a preventative, anticipatory and risk management drought policy 37. Ensure water use and supply forecasts consider the potential effects of climate change on existing new developments

CO-ORDINATION & PUBLIC INVOLVEMENT

H. Integrated Water Management	11 Clearly define and fully integrate agency mandates and activities related to water	38. Create a permanent intraprovincial government committee to identify joint priorities and budgets and support implementation of the Water Management Framework 39. Minimize duplication of services between federal and provincial agencies 40. Review and modify mandates and activities of provincial agencies involved in water management to avoid overlap and increase efficiency in the delivery of services 41. Streamline the approval process for licensing water related projects
	12 Manage water on a watershed basis	42. Assess options to provide local watershed management by consulting with stakeholders and reviewing existing legislation 43. Develop and implement water allocation policies on a watershed basis 44. Actively involve local authorities in a broad watershed approach to address local management issues

CO-ORDINATION & PUBLIC INVOLVEMENT

Goal	Objective	Actions
H. Integrated Water Management	13 Recognize Aboriginal peoples' interests	45. Consult on water management issues with First Nations and Metis organizations 46. Develop and implement a communication strategy for northern residents on changing water conditions and related water issues
	14 Adequate monitoring and research of water resources	47. Establish a provincial working group to provide recommendations for the development and operation of an integrated water-related database 48. Enhance and integrate the provincial water quality database so that it can be easily shared by agencies and organizations 49. Investigate development of a water research network to identify water-related research needs, oversee research, prioritize projects and administer joint budgets 50. Focus water research activities on water quality problems and small-scale treatment systems suitable for rural and northern Saskatchewan
I. Meaningful Public Awareness and Involvement	15 Enhance public awareness and involvement in water management planning and decision making	51. Establish a provincial Water Panel to review and share ideas on key water-related issues 52. Ensure stakeholder input in water flow management for major dams and reservoirs 53. Develop a public information strategy, including material on such issues as a water conservation by domestic, agricultural, municipal and industrial water users, groundwater, proper maintenance of wells and proper disposal of liquid waste from septic tanks 54. Encourage development of volunteer monitoring activities such as lake stewardship/co-management programs 55. Develop public involvement procedures for water management initiatives 56. Report progress on Water Management Framework biennially, starting September 2001
	16 Recognize the intrinsic and economic value of water and cost of its management	57. Develop long-term communication plans to increase public awareness and understanding of water management and the value and importance of water 58. Develop a consistent pricing rationale for water users that considers all costs associated with water projects, including their development, management and operation

Appendix G - Summary of Problem Identification, Cabinet Decision Item - November 20, 2000

Problem Facets	High rates of non-compliance by communities and owners of drinking water systems with the legislation.	Deficient and ageing water treatment systems incapable of producing safe drinking water.	Inadequately trained operators with limited access to resources for operating water treatment processes.	Limited knowledge, monitoring and resources for individuals who operate private and public (non-SERM regulated) water treatment systems.	A poorly informed general public without the resources to make informed decisions on water safety issues.
Current Risk Level	Current risk levels to the public are very high and can lead to a Walkerton type situation.	With existing deficiencies and continuing ageing of the infrastructure the risk to drinking water is very high.	The current level of risk to water quality is high.	Limited resources are available to make knowledgeable decisions for providing proper water treatment. The current risk to public health is high.	Limited educational information is available from the government. The current situation creates a medium risk level to the public.
Goals	Well managed and monitored public systems operated by municipalities and others which provide a reliable, high quality drinking water supply.	Effective and technically sound municipal water treatment facilities.	Well trained and knowledgeable operators capable of providing high quality and reliable drinking water.	Individuals with the capability and resources to properly operate and maintain their water systems.	An informed and knowledgeable citizenry with respect to issues relating to drinking water.
Objectives	To monitor, track and manage the safety and security of public drinking water systems.	To establish secure, risk management approaches to finance required new works and protect existing infrastructure.	To develop educational and training opportunities to ensure that water treatment systems are run by certified operators.	To implement a multi-element action plan designed to address gaps in safety for segments of the population which use water from high risk supplies.	To develop public awareness/education programs and internet accessibility of water quality databases to inform the public and support good decision making.

Elements and Associated Actions	The government will manage the safety and security of municipal, public and private drinking water systems by approving and providing for: laboratory capability and capacity for bacteriological analysis (already underway)(Detail B.2.1); delivery of a comprehensive quality control program at all water treatment facilities (Detail B.1.1); develop an interagency data management system (Detail B.1.3 and B.2.5); delivery of bacteriological response protocol - already underway (Detail B.1.2); and accreditation of the Provincial Laboratory to national standards (Detail B.2.2).	The government will establish secure, risk management approaches to finance required new works and protect existing infrastructure which target high risk water treatment and distribution systems through cost sharing grants (Detail B.3.1). This includes utilizing funding under the Centenary Program and the Canada/Sask Infrastructure Program for water systems.	Continue to implement the recently passed operator certification regulations (July 2000). This element does not require any new actions.	The government will implement a multi element action plan designed to address gaps in drinking water safety for segments of the population which use water from high risk supplies by: improving monitoring and ensure appropriate remedial action for the estimated 1500 public water systems that are not already regulated by SERM (Detail B.2.3); and by developing private water system programs to educate owners and operators (e.g. farmers, acreage owner, etc.) of private water systems on the need to sample, properly maintain and treat their water systems (Detail B.2.4).	The government will develop public awareness and educational programs (Detail B.1.5) and internet accessible water quality data (Detail B.1.4) to inform the public and thereby increase their capability of providing direct actions to determine how best to protect themselves from drinking water concerns.
Performance Indicators	Increased water quality monitoring submission rates. Fewer samples exceeding acceptable limits. Continued ability to quickly respond to health issues.	Improved drinking water quality trends. Fewer samples exceeding acceptable limits.	Annually review progress towards compliance.	Increase water quality monitoring submission rates. Fewer samples exceeding acceptable limits.	Number of inquiries from the general public. Number of times water quality information is accessed on the internet. Type of media questions received.
Implementation Plan Agency/Date	Health: Detail B.2.1 - Fully implemented but not sustainable with current resources. Detail B.2.2 - 2001 Detail B.2.5 - 2000 - 2002 SERM: Detail B.1.1 - Beginning 2000, full implementation by 2001. Detail B.1.2 - Fully implemented but not sustainable with current resources. Detail B.1.3 - Beginning 2001, full implementation by 2003.	Sask Water: Detail B.3.1 - Beginning 2001/2002 and running for 6 years.	None - implementation completed.	Health: Detail B.2.3 - Development starting 2001/2002, Completed 2002/2003. Detail B.2.4 - Development starting 2001/2002, Completed 2002/2003.	SERM: Detail B.1.4 - Fully implemented 2002/2002. Detail B.1.5 - Development starting 2001/2002. Completed 2002/2003.

Appendix H - *The Public Inquiries Act*

CHAPTER P-38

An Act respecting Inquiries concerning Public Matters

Short title

1 This Act may be cited as *The Public Inquiries Act*.

Commissions of inquiry

2 The Lieutenant Governor in Council, when he deems it expedient to cause inquiry to be made into and concerning a matter within the jurisdiction of the Legislature and connected with the good government of Saskatchewan or the conduct of the public business thereof, or that is in his opinion of sufficient public importance, may appoint one or more commissioners to make such inquiry and to report thereon.

R.S.S. 1978, c.P-38, s.2.

Power to summon witnesses

3 The commissioners shall have the power of summoning before them any witnesses, and of requiring them to give evidence on oath, or on solemn affirmation if they are persons entitled to affirm in civil matters, and orally or in writing, and to produce such documents and things as the commissioners deem requisite to the full investigation of the matters into which they are appointed to inquire.

R.S.S. 1978, c.P-38, s.3.

Power to compel attendance of witnesses

4 The commissioners shall have the same power to enforce the attendance of witnesses and to compel them to give evidence as is vested in any court of record in civil cases.

R.S.S. 1978, c.P-38, s.4.

Services of experts

5(1) The commissioners, if thereunto authorized by the Lieutenant Governor in Council, may engage the services of such accountants, engineers, technical advisers or other experts, clerks, reporters and assistants as they deem necessary or advisable, and also the services of counsel to aid and assist the commissioners in the inquiry.

(2) The commissioners may authorize and depute any such accountants, engineers, technical advisers or other experts, or any other qualified persons, to inquire into any matter within the scope of the commission.

(3) The persons so deputed when authorized by the Lieutenant Governor in Council, shall have the same powers as the commissioners have to take evidence, issue subpoenas, enforce the attendance of witnesses, compel them to give evidence and otherwise conduct the inquiry.

R.S.S. 1978, c.P-38, s.5.

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Appendix I - Order-in-Council - May 10, 2001

10 May 2001

357/2001

TO THE HONOURABLE

THE LIEUTENANT GOVERNOR IN COUNCIL

The undersigned has the honour to report that:

1 Sections 2 and 5 of *The Public Inquiries Act* provide, in part, as follows:

> 2 The Lieutenant Governor in Council, when he deems it expedient to cause inquiry to be made into and concerning a matter within the jurisdiction of the Legislature and connected with the good government of Saskatchewan or the conduct of the public business thereof, or that is in his opinion of sufficient public importance, may appoint one or more commissioners to make such inquiry and to report thereon.
>
> 5(1) The commissioners, if thereunto authorized by the Lieutenant Governor in Council, may engage the services of such accountants, engineers, technical advisors or other experts, clerks, reporters and assistants as they deem necessary or advisable, and also the services of counsel to aid and assist the commissioners in the inquiry.

2 It is deemed advisable and in the public interest that an inquiry be made into the safety of the public drinking water in the City of North Battleford, in the Province of Saskatchewan.

The undersigned has the honour, therefore, to recommend that Your Honour's Order do issue pursuant to sections 2 and 5 of *The Public Inquiries Act*:

(a) appointing The Honourable Mr. Justice Robert D. Laing as a Commissioner of a Commission of Inquiry into matters relating to the safety of the public drinking water in the City of North Battleford, as set out in the terms of reference attached hereto as Schedule A;

(b) establishing the terms of reference of the Commission of Inquiry as set out in Schedule A, attached hereto;

(c) directing the said Commission to make its report to the Minister of Justice in accordance with those terms of reference;

(d) authorizing the Commission to engage the services of such experts, clerks, reporters and assistants as deemed necessary or advisable, and also the services of counsel to aid and assist the Commission, to be paid by the Department of Justice as approved by the Minister of Justice;

- 2 -

(e) authorizing reimbursement to the Commissioner by the Department of Justice for reasonable travelling and sustenance expenses incurred by him in the performance of his duties;

(f) directing all Departments, agencies and Crown Corporations of the Government of Saskatchewan to assist the Commission to the fullest extent so that the Commission may carry out its duties; and,

(g) authorizing payment by the Department of Justice of expenses incurred in the administration of the Commission of Inquiry.

RECOMMENDED BY: ______________________
Minister of Justice and Attorney General

APPROVED BY: Lorne Calvert
President of the Executive Council

ORDERED BY: Lynda Haverstock
Lieutenant Governor

Regina, Saskatchewan

SCHEDULE A to OC 357/2001

TERMS OF REFERENCE

1. The Commission of Inquiry appointed pursuant to this Order will have the responsibility to inquire into and report on and make findings and recommendations with respect to any and all aspects of the following matters:

   (a) the circumstances that led to the current contamination of the public water supply of the City of North Battleford;

   (b) the adequacy and effectiveness of the actions taken by officials of the Government of Saskatchewan, the Battlefords District Health Board and the City of North Battleford leading up to and in response to the discovery of the contamination of the public water supply in the City of North Battleford;

   (c) the effect, if any, of the regulations, bylaws, policies, guidelines, procedures and practices of or applicable to the Government of Saskatchewan, the Battlefords District Health Board and the City of North Battleford on the events referred to in (a) and (b);

   (d) any other relevant matters that the Commission considers necessary to determine that the City of North Battleford's public drinking water is safe in the future.

2. The Commission shall perform its duties without expressing any legal conclusion or recommendation regarding the civil or criminal responsibility of any person or organization.

3. The Commission shall complete its inquiry and deliver its final report, comments, findings, conclusions and recommendations to the Minister of Justice by March 31, 2002. The Commission may give the Minister of Justice such interim reports as it considers appropriate to address urgent matters in a timely fashion. Each report must be in a form appropriate for release to the public, subject to *The Freedom of Information and Protection of Privacy Act* and other laws.

4. The Commission shall hold public hearings but may hold some proceedings *in camera* where it is the opinion of the Commission that it is necessary to do so.

5. The Commission shall determine applications by those parties, if any, or those witnesses, if any, to the public inquiry that apply to the Commission to have their legal counsel paid for by the Commission and further determine at what rate such counsel shall be paid for their services.

6. The Commission may set such rules of practice and procedure for the conduct of its duties as it deems appropriate.

Appendix J - Rules of Procedure and Practice

NORTH BATTLEFORD
WATER INQUIRY

Justice Robert D. Laing
Commissioner

RULES OF PROCEDURE AND PRACTICE

1. In accordance with the Commission's terms of reference, Commission proceedings will focus on :

(a) the circumstances that led to the current contamination of the public water supply of the City of North Battleford;

(b) the adequacy and effectiveness of the actions taken by officials of the Government of Saskatchewan, the Battlefords District Health Board and the City of North Battleford leading up to and in response to the discovery of the contamination of the public water supply in the City of North Battleford;

(c) the effect, if any, of the regulations, bylaws, policies, guidelines, procedures and practices of or applicable to the Government of Saskatchewan, the Battlefords District Health Board and the City of North Battleford on the events referred to in (a) and (b); and

(d) any other relevant matters that the Commission considers necessary to determine that the City of North Battleford's public drinking water is safe in the future.

A. RULES

I. GENERAL

2. Public hearings will be convened in North Battleford to address issues related to the Inquiry.

3. All parties and their counsel shall be deemed to undertake to adhere to these Rules, which may be amended or dispensed with by the Commission as it sees fit to ensure fairness. Any party may raise any issue of non-compliance with the Commissioner.

4. Insofar as it needs to gather evidence, the Commission is committed to a process of public hearings. However, applications on some aspects of its mandate may be made to proceed *in camera* in accordance paragraph 4 of the Commission's terms of reference. Such applications should be made in writing at the earliest possible opportunity pursuant to the provisions of Section III(vi) below.

II. STANDING

5. Commission counsel, who will assist the Commission throughout the Inquiry and are to ensure the orderly conduct of the Inquiry, have standing throughout the Inquiry. Commission counsel have the primary responsibility for representing the public interest at the Inquiry, including the responsibility to ensure that all interests that bear on the public interest are brought to the Commissioner's attention. Persons or groups may be granted standing by the Commissioner if the Commissioner is satisfied that they:

a. are directly and substantially affected by the Inquiry; or

b. represent clearly ascertainable interests and perspectives that are essential to his mandate, which the Commissioner considers ought to be separately represented before the Inquiry, in which event the party may participate in a manner to be determined by the Commissioner.

6. The Commissioner will determine those parts of the Inquiry in which a party granted standing may participate.

7. The term "party" is used to convey the grant of standing and is not intended to convey notions of an adversarial proceedings.

8. Counsel representing witnesses called to testify before the Commission may participate during the hearing of such evidence as provided in these Rules.

III. EVIDENCE

(i) General

9. In the ordinary course Commission counsel will call and question witnesses who testify at the Inquiry. Counsel for a party may apply to the Commissioner to lead a particular witness's evidence in-chief. If counsel is granted the right to do so, examination shall be confined to the normal rules governing the examination of one's own witness.

10. The Commission is entitled to receive any relevant evidence that might otherwise be inadmissible in a court of law. The strict rules of evidence will not apply to determine the admissibility of evidence.

11. Parties shall provide to Commission counsel the names and addresses of all witnesses they feel ought to be heard, and shall provide to Commission counsel copies of all relevant documentation, including statements of anticipated evidence, at the earliest opportunity.

12. Commission counsel have a discretion to refuse to call or present evidence.

13. When Commission counsel indicate that they have called the witnesses whom they intend to call in relation to a particular issue, a party may then apply to the Commissioner for leave to call a witness whom the party believes has evidence relevant to that issue. If the Commissioner is satisfied that the evidence of the witnesses is needed, Commission counsel shall call the witness, subject to Rule 9.

(ii) Witnesses

14. Anyone interviewed by or on behalf of Commission counsel is entitled, but not required, to have one personal counsel present for the interview to represent his or her interests.

15. Witnesses will give their evidence at a hearing under oath or affirmation.

16. Witnesses may require that the Commission hear evidence pursuant to a subpoena in which case a subpoena shall be issued.

17. Witnesses who are not represented by counsel for parties with standing are entitled to have their own counsel present while they testify. Counsel for a witness will have standing for the purposes of that witness' testimony to make any objections thought appropriate.

18. Witnesses may be called more than once.

(iii) Order of Examination

19. The order of examination will be as follows:

a. Commission counsel will adduce the evidence from the witnesses. Except as otherwise directed by the Commissioner, Commission counsel are entitled to adduce evidence by way of both leading and non-leading questions;

b. parties granted standing to do so will then have an opportunity to cross-examine the witness to the extent of their interest. The order of cross-examination will be determined by the parties having standing and if they are unable to reach agreement, by the Commissioner;

c. counsel for a witness, regardless of whether or not counsel is also representing a party, will examine last, unless he or she has adduced the evidence of that witness in-chief, in which case there will be a right to re-examine the witness; and

d. Commission counsel will have the right to re-examine.

20. Except with the permission of the Commissioner, no counsel other than Commission counsel may speak to a witness about the evidence that he or she has given until the evidence of such witness is complete. Commission counsel may not speak to any witness about his or her evidence while the witness is being cross-examined by other counsel.

(iv) Access to Evidence

21. All evidence shall be categorized and marked P for public sittings and, if necessary, C for sittings *in camera*.

22. Electronic copies of the P transcript of evidence will be provided to parties by the court reporter. Hard copies of the transcript may be ordered by anyone prepared to pay the cost. One copy of the P transcript and the P exhibits of the public hearings will be made available for public review.

23. Another copy of the P transcript of the public hearings and a copy of P exhibits will be available to be shared by the media.

24. Only those persons authorized by the Commission in writing shall have access to C transcripts and exhibits.

(v) Documents

25. The Commission expects all relevant documents, including statements of anticipated evidence, to be produced to the Commission by any party with standing at the earliest opportunity.

26. Originals of relevant documents are to be provided to Commission counsel upon request.

27. Counsel to parties and witnesses will be provided with documents and information, including statements of anticipated evidence, only upon giving an undertaking that all such documents or information will be used solely for the purpose of the Inquiry and, where the Commission considers it appropriate, that its disclosure will be further restricted. The Commission may require that documents provided, and all copies made, be returned to the Commission if not tendered in evidence. Counsel are entitled to provide such documents or information to their respective clients only on terms consistent with the undertakings given, and upon the clients entering into written undertakings to the same effect. These undertakings will be of no force regarding any document or information once it has become part of the public record. The Commission may, upon application, release any party in whole or in part from the provisions of the undertaking in respect of any particular document or other information.

28. Documents received from a party, or any other organization or individual, shall be treated as confidential by the Commission unless and until they are made part of the public record or the Commissioner otherwise declares. This does not preclude the Commission from producing a document to a proposed witness prior to the witness giving his or her testimony, as part of the investigation being conducted, or pursuant to Rule 27.

29. Subject to Rule 27 and to the greatest extent possible, Commission counsel will endeavour to provide in advance to both the witness and the parties with standing relating to issues with respect to which the witness is expected to testify, documents that will likely be referred to during the course of that witness' testimony, and a statement of anticipated evidence.

30. Parties shall, at the earliest opportunity, provide Commission counsel with any documents that they intend to file as exhibits or otherwise refer to during the hearings, and in any event shall provide such documents no later than the day before the document will be referred to or filed.

31. A party who believes that Commission counsel has not provided copies of relevant documents must bring this to the attention of Commission counsel at the earliest opportunity. The object of this rule is to prevent witnesses from being surprised with a relevant document that they have not had an opportunity to examine prior to their testimony. If Commission counsel decides the document is not relevant, it shall not be produced as a relevant document. This does not preclude the document from being used in cross-examination by any of the parties. Before such a document may be used for the purposes of cross examination, a copy must be made available to all parties by counsel intending to use it not later than the day prior to the testimony of that witness, subject to the discretion of the Commissioner.

(vi) Confidentiality

32. If the proceedings are televised, applications may be made for an order that the evidence of a witness not be televised or broadcast.

33. Any witness may apply to the Commissioner to be granted "Confidentiality" which shall be at the discretion of the Commissioner. For the purposes of the Inquiry, Confidentiality shall include the right to have his or her identity disclosed only by way of non-identifying initials, and, if the individual so wishes, the right to testify before the Commission in private. Subject to the discretion of the Commissioner, only the Commissioner, Commission staff and counsel, counsel for parties with standing, counsel for the witness who has been granted Confidentiality and media representatives may be present during testimony being heard in private.

34. A witness who is granted Confidentiality will not be identified in the public records and transcripts of the hearing except by non-identifying initials. Any reports of the Commission using the evidence of witnesses who have been granted Confidentiality will use non-identifying initials only.

35. Media reports relating to the evidence of a witness granted Confidentiality shall avoid references that might reveal the identity of the witness. No photographic or other reproduction of the witness shall be made either during the witness' testimony or upon his or her entering and leaving the site of the Inquiry.

36. Any witness who is granted Confidentiality will reveal his or her name to the Commission and counsel participating in the Inquiry in order that the Commission and counsel can prepare to question the witness. The Commission and Counsel shall maintain confidentiality of the names revealed to them. No such information shall be used for any other purpose either during or after the completion of the Commission's mandate.

37. Any witness who is granted Confidentiality may either swear an oath or affirm to tell the truth using the non-identifying initials given for the purpose of the witness's testimony.

38. All parties, their counsel and media representatives shall be deemed to undertake to adhere to the rules respecting Confidentiality. A breach of these rules by a party, counsel to a party or a media representative shall be dealt with by the Commissioner, as he sees fit.

Appendix K - Funding

NORTH BATTLEFORD
WATER INQUIRY

Justice Robert D. Laing
Commissioner

FUNDING

I. GENERAL

1. The Terms of Reference of the North Battleford Water Inquiry provide that the Commission of Inquiry will have the responsibility to inquire into and report on and make findings and recommendations with respect to any and all aspects of the following matters:

a. the circumstances that led to the current contamination of the public water supply of the City of North Battleford;

b. the adequacy and effectiveness of the actions taken by officials of the Government of Saskatchewan, the Battlefords District Health Board and the City of North Battleford leading up to and in response to the discovery of the contamination of the public water supply in the City of North Battleford;

c. the effect, if any, of the regulations, bylaws, policies, guidelines, procedures and practices of or applicable to the Government of Saskatchewan, the Battlefords District Health Board and the City of North Battleford on the events referred to in (a) and (b); and

d. any other relevant matters that the Commission considers necessary to determine that the City of North Battleford's public drinking water is safe in the future.

II. CRITERIA

2. To be considered for a funding recommendation an applicant must:

a. have obtained standing for the Inquiry;

b. be able to demonstrate insufficient financial resources to enable the Applicant adequately to represent its/his/her interest; and

c. provide a clearly delineated written proposal as to the use the applicant intends to make of the funds and how it/he/she will account for the funds.

3. The Commissioner will also consider other factors in making his funding recommendations, including the following:

a. the nature of the applicant's interest and/or proposed involvement in the Inquiry. There should be a clearly ascertainable interest that ought to be represented at the Inquiry such that separate and adequate representation of that interest will make a necessary and substantial contribution to the Inquiry;

b. whether the applicant has an established record of concern for and a demonstrated commitment to the interest it seeks to represent;

c. whether the applicant has special experience or expertise with respect to the Commission's mandate; and

d. whether the applicant has attempted to form a group with others of similar interests.

III. APPLICATIONS

4. Applications for funding should be made in writing and should provide the following information:

a. A statement of how the applicant satisfies the criteria for funding set out in the Rules of Procedure and Practice. In demonstrating why an applicant would not otherwise be able to participate without such funding, the application should include financial statements and operating budgets and describe the number of members and membership fee structure. Applicants should also indicate whether they have contacted other groups or individuals in an effort to create an amalgamated group, and the results of those contacts;

b. A description of the purposes for which the funds are required, how the funds will be disbursed and how they will be accounted for;

c. A statement of the extent to which the applicant will contribute his/her/its own funds and personnel to participate in the Inquiry; and

d. The name, address, telephone number and position of the individual who will be responsible for administering the funds, and a description of the financial controls put in place to ensure that the funds are disbursed for the purposes of the Inquiry.

IV. RETURN DATE FOR MATERIALS

5. Written applications for standing and/or funding, together with all relevant materials attached, should be submitted to the Inquiry by delivering a copy to the Inquiry's offices in Saskatoon at the address set out below by no later than 4:00 p.m. on the 22nd day of June, 2001.

The North Battleford Water Inquiry
Suite 802, 119 4TH Avenue South
Saskatoon, SK S7K 5X2

Telephone: (306) 964-1200
Fax: (306) 964-1206

Website: www.northbattlefordwaterinquiry.ca

Appendix L - Notice of Hearing

NORTH BATTLEFORD
WATER INQUIRY

Justice Robert D. Laing
Commissioner

NOTICE OF HEARING

Mr. Justice Robert D. Laing has been appointed as the Commissioner of the North Battleford Water Inquiry. The Commission will inquire into the circumstances which caused some people in the North Battleford area to become ill in the spring of 2001, at or around the same time as cryptosporidium bacteria were found to be present in the City's water supply, and the cause of these events including the effect, if any, of government policies, procedures and practices. Specifically, the terms of reference of the Commission are to inquire into and report on and make findings and recommendations with respect to any and all aspects of the following matters:

(a) the circumstances that led to the current contamination of the public water supply of the City of North Battleford;

(b) the adequacy and effectiveness of the actions taken by officials of the Government of Saskatchewan, the Battlefords District Health Board and the City of North Battleford leading up to and in response to the discovery of the contamination of the public water supply in the City of North Battleford;

(c) the effect, if any, of the regulations, bylaws, policies, guidelines, procedures and practices of or applicable to the Government of Saskatchewan, the Battlefords District Health Board and the City of North Battleford on the events referred to in (a) and (b); and

(d) any other relevant matters that the Commission considers necessary to determine that the City of North Battleford's public drinking water is safe in the future.

Applications by interested parties, organizations, individuals and groups for standing and funding in relation to the Inquiry will be heard commencing at 10:30 a.m. on the 26th and 27th days of June, 2001 at the Battleford Room, the Tropical Inn, 1001 Highway 16 Bypass, North Battleford, Saskatchewan. **NO EVIDENCE WILL BE HEARD AT THIS TIME**.

The criteria for standing and for funding in the Inquiry are set out in the Rules of Procedure and Practice which can be obtained by contacting the Inquiry at the addresses and/or telephone numbers set out below.

Applications for standing should be made in writing and should clearly demonstrate how the applicant satisfies the criteria for standing set out in the Rules of Procedure and Practice.

Applications for funding should be made in writing and should provide the following information:

1. A statement of how the applicant satisfies the criteria for funding set out in the Rules of Procedure and Practice. In demonstrating why an applicant would not otherwise be able to participate without such funding, the application should include financial statements and operating budgets and describe the number of members and membership fee structure. Applicants should also indicate whether they have contacted other groups or individuals in an effort to create an amalgamated group, and the results of those contacts;

2. A description of the purposes for which the funds are required, how the funds will be disbursed and how they will be accounted for;

3. A statement of the extent to which the applicant will contribute his/her/its own funds and personnel to participate in the Inquiry; and

4. The name, address, telephone number and position of the individual who will be responsible for administering the funds, and a description of the financial controls put in place to ensure that the funds are disbursed for the purposes of the Inquiry.

Written applications for standing and/or funding with all relevant materials attached should be submitted to the Inquiry by delivering a copy to our offices in Saskatoon at the addresses set out below by no later than 4:00 p.m. on the 22nd day of June, 2001.

THE NORTH BATTLEFORD WATER INQUIRY
Suite 802, 119 4th Avenue South
Saskatoon, Saskatchewan
S7K 5X2

Telephone: (306) 964-1200
Fax: (306) 964-1206

Website: www.northbattlefordwaterinquiry.ca

Appendix M - Ruling on Standing and Funding

NORTH BATTLEFORD
WATER INQUIRY

Justice Robert D. Laing
Commissioner

RULING ON STANDING AND FUNDING

By Order-in-Council 357/2001 dated May 10, 2001, I was appointed Commissioner of this Commission of Inquiry into matters relating to the safety of the public drinking water in the City of North Battleford as set out in the terms of reference. The terms of reference for the Inquiry are:

1. The Commission of Inquiry appointed pursuant to the Order will have the responsibility to inquire into and report on and make findings and recommendations with respect to any and all aspects of the following matters:

   a) the circumstances that led to the current contamination of the public water supply of the City of North Battleford;

   b) the adequacy and effectiveness of the actions taken by officials of the Government of Saskatchewan, the Battlefords District Health Board and the City of North Battleford leading up to and in response to the discovery of the contamination of the public water supply in the City of North Battleford;

   c) the effect, if any, of the regulations, bylaws, policies, guidelines, procedures and practices of or applicable to the Government of Saskatchewan, the Battlefords District Health Board and the City of North Battleford on the events referred to in (a) and (b);

   d) any other relevant matters that the Commission considers necessary to determine that the City of North Battleford's public drinking water is safe in the future.

Standing Hearing

Prior to the standing hearings which took place in North Battleford on June 26, 2001, Rules of Procedure and Practice were published applicable to the Inquiry, including a section on standing which stated:

> **II. STANDING**
>
> 5. Commission counsel, who will assist the Commission throughout the Inquiry and are to ensure the orderly conduct of the Inquiry, have standing throughout the Inquiry . Commission counsel have the primary responsibility for representing the public interest at the Inquiry, including the responsibility to ensure that all interests that bear on the public interest are brought to the Commissioner's attention. Persons or groups may be granted standing by the Commissioner if the Commissioner is satisfied that they:
>
> A. are directly and substantially affected by the Inquiry; or

B. represent clearly ascertainable interests and perspectives that are essential to his mandate, which the Commissioner considers ought to be separately represented before the Inquiry, in which event the party may participate in a manner to be determined by the Commissioner.

6. The Commissioner will determine those parts of the Inquiry in which a party granted standing may participate.

7. The term "party" is used to convey the grant of standing and is not intended to convey notions of an adversarial proceeding.

8. Counsel representing witnesses called to testify before the Commission may participate during the hearing of such evidence as provided in these Rules.

A notice of the standing hearing was published in relevant newspapers on June 6~ 2001, and advised that applications for standing should be made in writing and submitted to the Inquiry offices by June 22, 2001. The notice indicated that applications for standing should clearly demonstrate how the applicant satisfies the criteria for standing.

At the hearing, each applicant provided a brief oral summary of the application~ and in doing so, indicated whether they were seeking full or special standing, or observer status only. The applicants were advised that a party granted anyone of the three standings would have access to working spaces at designated counsel tables at all hearings. In the end result, every applicant applied for full participation standing.

Basis for Granting Standing

In the end result I have decided to grant full participation standing to each of the applicants, because I am not certain at this time that within the time constraints imposed by the terms of reference and the schedule that I and Commission counsel have agreed we will attempt to meet, that evidence led at the Inquiry can be so compartmentalized in anyone day or week to avoid touching on matters that directly and substantially affect a party, or a party's ascertainable interest in the proceedings. Likewise, the matters to be inquired into form a continuum, and anyone witness may touch on more than one matter, with the result that is reasonable that all applicants have the opportunity to be informed and participate with respect to all evidence to be called.

Full standing includes:

1. access to documents collected by the Commission subject to the Rules of Procedure and Practice;

2. advance notice of documents which are proposed to be introduced into evidence;

3. advance provision of statements of anticipated evidence;

4. a seat at counsel table;

5. the opportunity to suggest witnesses to be called by Commission counsel, failing which an opportunity to apply to me to lead the evidence of a particular witness;

6. the opportunity to cross-examine witnesses on matters relevant to the basis upon which standing was granted;
7. the opportunity to review transcripts at Commission offices (a copy of the transcript may be purchased from the court reporter);
8. the opportunity to make closing submissions; and
9. the opportunity to apply for funding.

I advised counsel for the respective applicants at the hearing on standing that in the interests of effective, efficient, timely and fair conduct of this Inquiry, it was my intention to apply fairly strictly the rule with respect to who may cross-examine any particular witness. There is an added factor in taking this position in this matter, and that is the fact that one of the applicants is a group of North Battleford citizens who have brought action against three of the other applicants, being the City of North Battleford, the Government of Saskatchewan, and the Battlefords District Health Board, claiming damages for personal injury and other economic loss arising out of the events which caused this Inquiry to be called. A concern has been expressed by some applicants that the Inquiry should not deteriorate into an examination for discovery with respect to the lawsuit; a sentiment with which I totally agree. The method of ensuring this does not happen will be to restrict the right of a party to cross-examine to those matters relevant to the basis upon which standing is granted.

Basis on which Standing is Granted

The applicants who are directly and substantially affected by all aspects of the Inquiry are as follows:

1. The City of North Battleford

All of the terms of reference apply to the public water supply of the City of North Battleford. It follows the City will be directly affected by all aspects of the Inquiry. It also has a clearly ascertainable interest.

2. The Government of Saskatchewan who will be represented through three government departments and one Crown corporation which are:

   a) Saskatchewan Environment and Resource Management;
   b) Saskatchewan Health;
   c) Saskatchewan Municipal Affairs and Housing; and
   d) Saskatchewan Water Corporation.

One or more of the foregoing departments or corporation had direct involvement in all aspects of the terms of reference. The Government of Saskatchewan will be directly affected by the Inquiry and also has an ascertainable interest in the safety of the quality of drinking water in North Battleford and elsewhere in Saskatchewan.

The applicants who are directly and substantially affected by parts of the Inquiry are:

1. Battlefords District Health Board

Under the provisions of The Public Health Act, 1994, S.S. 1994, c. P-37.1 ("the Act"), the Board played a direct role in controlling the outbreak of cryptosporidiosis. The Board employs a medical health officer and public health inspectors, and has responsibility within limits set out in the Act for the administration and enforcement of the Act. The Board has a direct interest in all matters related to the health of the Battleford's district.

2. Dr. David Butler-Jones, Chief Medical Officer for the Province of Saskatchewan, Dr. Eric Young, Deputy Chief Medical Officer, and Dr. J. Gerharde Benadé, Medical Health Officer for the Battlefords Health District

The foregoing three doctors are represented by the same counsel. The application indicates they were all directly involved with the water situation in North Battleford. All three of them took certain actions, the adequacy and effectiveness of which are part of the terms of reference. They are interested in preventing a reoccurrence of this type of outbreak in the future, both in North Battleford and elsewhere. Each of the doctors holds a statutory office pursuant to the Act, and takes the position his interest is distinct from that of the Battleford Health District or the Government of Saskatchewan.

3. C.U.P.E. Local 287 on behalf of eight employees of the City of North Battleford, whose employment consists of operating the sewage treatment plant and the water treatment plant

Everything that was done at the water treatment plant or sewage disposal plant was done by one or more of these employees. The application indicates each of these persons could be affected by the ultimate report issued in the matter. The application makes the point their interests are different from that of the City of North Battleford due to the employer/employee relationship that exists between this group and the City of North Battleford.

The three applicants who represent clearly ascertainable interests are:

1. The citizens' group which has commenced civil action against the parties outlined above.

While this group was directly and substantially affected by the contamination of the water in North Battleford, this group is not directly and substantially affected by the Inquiry. However, they do represent a clearly ascertainable interest in ensuring that the drinking water in North Battleford remains safe in the future, and they have a perspective on how the contaminated water affected them as citizens. This group will be in a position to offer victim impact perspective, and also perspective on the responses offered by employees and elected officials at both the city and provincial levels.

2. Association of Professional Engineers and Geoscientists of Saskatchewan

This Association is responsible for regulating the professions of engineering and geoscience in Saskatchewan. Its statutory mandate includes the fostering of practices of professional engineering and professional geoscience in a manner that safeguards the public and protects the public interest. In this respect it has an ascertainable interest, and will be able to offer a perspective on all aspects of engineering and geoscience that might arise in the course of the Inquiry, as well as on the regulatory regime presently in place with respect to the public water supply in North Battleford.

3. Saskatchewan Environmental Society and Nature Saskatchewan

This coalition of environmental groups have a demonstrated ongoing interest and are involved in projects to protect water quality in Saskatchewan. While the interest of these organizations is not specific to North Battleford, the group represents a perspective on the causes and effects relating to water quality which would not necessarily be available to the Inquiry without their participation. This group also has a perspective on the regulatory regime relating to the quality of drinking water in Saskatchewan.

Funding

Applicants for Funding

The applicants for funding are:

(1) City of North Battleford:

(2) Saskatchewan Environmental Society and Nature Saskatchewan;

(3) Canadian Union of Public Employees Local 287; and

(4) Scharfstein, Gibbings, Walen and Fisher on behalf of 407 individuals and corporations.

All of the applicants will receive funding as hereinafter set out.

Reasons for Funding

1. City of North Battleford

The City of North Battleford takes the position that its citizens should not have to fund the City's involvement at the Inquiry hearings when it is already involved in a lawsuit, and did not ask for the public Inquiry which was called by the Saskatchewan Government. It takes the position that it would be unfair if the Provincial Government lawyers are funded by the Province and the citizens of North Battleford should have to fund in addition to their provincial tax dollars, the City's additional costs of preparation and participation at the hearings. There is merit in this position. There is an additional reason why I consider it appropriate to fund the City. It is, that for reasons set out below, I have decided to fund the citizens' group who have brought the action against the City. It would be unfair to fund this citizens' group and not the City of North Battleford.

2. The Citizens' Group

Looked at in one respect, it would have been preferable if another citizens' group other than a group of plaintiffs had applied to represent the citizens of North Battleford at this Inquiry, but this did not happen. As noted above, it would not be desirable that an inquiry such as this proceed without the participation of a citizens' group and the perspectives they might offer on the events that are the subject of the Inquiry. I am satisfied that the citizens' group would not be represented at all if counsel was not separately funded for attendance at the Inquiry hearings and the preparation time for the same.

3. Canadian Union of Public Employees Local 287

Local 287 is a relatively small unit of employees employed by the City of North Battleford. It filed financial information indicating it does not have the financial resources to fund counsel to attend the Inquiry hearings and prepare for the same. It points out that neither its national or provincial body is prepared to contribute funding for this purpose.

4. The Saskatchewan Environmental Society and Nature Saskatchewan Coalition

The coalition members are charitable organizations which operate on modest annual budgets, that do not take into account an extraordinary item such as funding counsel to prepare for and attend the Inquiry hearings.

Method of Funding

Article 5 of the terms of reference for the Inquiry provides:

> 5 The Commission shall determine applications by those parties, if any, or those witnesses, if any, to the public inquiry that apply to the Commission to have their legal counsel paid for by the Commission and further determine at what rate such counsel shall be paid for their services.

Prior to the funding hearing, guidelines were published for reimbursement of legal fees and expenses, which included the hourly rates that would be considered for junior, intermediate and senior lawyers. The guidelines stated in part:

> The legal fees and expenses eligible for reimbursement are those which relate to reasonable preparation for and representation at those portions of the Inquiry for which standing has been accorded to the client, subject to the Commissioner's recommendations. . . .

This Commission is not funded with an individual budget, but rather the Government of Saskatchewan is paying expenses incurred by the Commission on an ongoing basis. Saskatchewan Justice approved my recommendation for the hourly rates payable for the various levels of seniority of lawyers. Concern was expressed at the hearing about the possibility that accounts rendered for legal services by applicant counsel would be forwarded to Saskatchewan Justice for payment and that this could amount to a breach of the solicitor-client privilege. In the end result, I do not believe this is a concern, because of the method for reimbursement of counsel fees I propose to implement. Likewise, the guidelines published originally stated that a lawyer accepting compensation shall not bill the client for any additional funding for the services in question. In view of the fact that four of the parties who have been granted standing are also parties to a civil lawsuit, I no longer consider this guideline appropriate. Again, I am influenced by the funding formula I propose to implement.

At the present time it is not known how many days of hearings will be required to present evidence relevant to the terms of reference in this matter. Clearly, days spent by counsel for an applicant at the Inquiry's hearings is additional to time that would otherwise be spent by counsel for those applicants who are involved in the civil lawsuits. At the same time, a certain amount of preparation will be required by lawyers for applicants participating in the Inquiry that would be additional to time otherwise spent on a lawsuit. At this point it is important to remember that this Inquiry is committed to making public all relevant documents and evidence of witnesses through the medium of the Inquiry's website. Participating in the Inquiry will not result in any additional disclosure being available to parties who have standing. It may be that the documentation and/or testimony of witnesses will be of assistance to the parties with respect to the lawsuit, but the organization and preparation necessary for each party with respect to this Inquiry will contain an additional component to that which would be required for the lawsuit.

Taking the foregoing into account, I have decided the fairest way to compensate the applicants who receive funding for counsel in connection with this Inquiry is, subject to some additional funding for C.U.PE. and the Saskatchewan environmental coalition, to fund every hour spent at the Inquiry's hearings along with reasonable claims for travel expenses and disbursements at the prevailing Saskatchewan Government rates, and to allow one hour of preparation for each hour spent at the Inquiry's hearings. I consider one hour of preparation time for each hour of hearing a reasonable average amount of preparation, while recognizing that the preparation time required of each counsel will not be so neatly apportioned in terms of time spent on preparation.

As a result of the foregoing method of reimbursement of counsel for applicants granted funding to participate in this Inquiry, such counsel will simply have to submit to the Commission an invoice indicating the number of hearing hours attended, plus one hour for actual preparation time spent up to a maximum amount of the hearing hours attended to that point in time. To the extent that all preparation time cannot be billed in anyone month, such time may be carried forward to the next month. This should avoid any concerns of breach of solicitor-client privilege. Counsel who act for applicants who qualify for the foregoing funding may submit invoices to the Commission at the end of each month in which hearings take place.

In addition to the foregoing funding formula, C.U.P .E. and the environmental coalition will each be funded an additional $10,000 in counsel preparation time, in order that counsel might familiarize themselves with the events which resulted in this Inquiry being called, and familiarize themselves with the engineering and science subjects that arise out of the terms of reference. The lawyers acting for parties in the lawsuit have already been required to familiarize themselves with such matters. The lump sum preparation time may be billed by counsel as incurred, at a rate no greater than that allowed for the hearings as hereinafter set out, but may also be invoiced at a lesser rate in the event such counsel choose to use more junior persons in their office for such preparation purposes. This lump sum preparation time may be invoiced monthly indicating the number of hours of preparation and the appropriate hourly rate for such hours, and certified by counsel as time incurred in preparation for the Inquiry.

In addition, time spent by counsel at the request of Commission counsel, or in attendance while that party's witnesses are being interviewed by Commission counsel, may be invoiced in addition to the amounts set out in the foregoing.

The funding guidelines provided that unless the Commission recommended otherwise, only one counsel per client would be eligible for reimbursement. One of the applicants requested approval for a junior counsel, and one applicant requested funding for a paralegal. Bearing in mind that Commission counsel will be leading most, if not all, of the evidence at this Inquiry, and the role of participants' counsel will consist largely of preparation for cross-examination of witnesses to be called by Commission counsel, I do not consider it necessary that junior counselor a paralegal be funded for the two parties requesting the same. Should counsel for the applicant not personally attend the hearings in anyone day, it is appropriate for another counsel from that person's firm to attend the hearings in place of that person, and in such cases, the substitute lawyer shall be funded at the rate of two-thirds of that allowed for the nominal counsel.

Hourly Rate for Funding

Counsel acting for the City of North Battleford and for C.U.P.E. Local No. 287 are both very senior counsel with expertise in civil litigation and administrative law matters. Each counsel qualifies for the highest hourly rate available of$192.00 per hour.

Counsel for the citizens' group and the environmental coalition are also reasonably senior lawyers with extensive experience and expertise in the area relevant to this Inquiry. Each counsel qualifies in the middle of the range allowed for this type of seniority and experience of$160.00 per hour.

Dated at the City of Saskatoon, in the Province of Saskatchewan this 9th day of July, 2001.

Justice Robert D. Laing

Appendix N - Appearances of Counsel

NORTH BATTLEFORD
WATER INQUIRY

Appearances of Counsel

Commission Counsel	James Russell
Assistant Commission Counsel	Christopher C. Boychuk Blair P. Bleakney
The City of North Battleford	L. Ted Priel, Q.C. Kenneth A. Stevenson, Q.C.
Province of Saskatchewan	Michael D. Tochor Lian M. Schwann
Canadian Union of Public Employees, Local 287	Robert W. Mitchell, Q.C. Sandra G. Mitchell
Citizens Group	Grant J. Scharfstein
Association of Professional Engineers and Geoscientists of Saskatchewan	Robert H. McDonald
Battlefords District Health Board	Gary D. Young, Q.C. Mark Vanstone
Saskatchewan Environmental Society and Nature Saskatchewan	Scott Hopley
Dr. Gerharde Benadé, Dr. David Butler-Jones, Dr. Eric Young	Neil G. Gabrielson, Q.C.

Appendix O - Witness List

NORTH BATTLEFORD
WATER INQUIRY

Justice Robert D. Laing
Commissioner

Witness List

Name	*Position*	*Date Testified*
Peter Allen	Plant Operator, City of North Battleford	October 12, 2001
Dr. Miodrag Belosevic	Professor of Biological Sciences University of Edmonton	September 18, 2001
Dr. Gerharde Benadé	Medical Health Officer, Battlefords Health District	October 15, 2001 October 16, 2001
Robert Berry	Director, Public Works and Utilities, City of North Battleford (1993 to 1999)	December 5, 2001
Dr. David Butler-Jones	Chief Medical Health Officer, Saskatchewan Health	October 17, 2001 October 18, 2001
Marie-Ann Bowden	Professor, College of Law, University of Saskatchewan	December 4, 2001
Bruce Clark	Laboratory Coordinator, Environmental Compliance Branch, Utility Services, City of Saskatoon	October 19, 2001
Dr. Andrea Ellis	Section Head, Outbreak Response and Issues Management, Division of Enteric, Foodborne and Waterborne Diseases, Bureau of Infectious Diseases, Centre for Infectious Disease Prevention and Control, Population and Public Health Branch, Health Canada	October 10, 2001

Patrick Fluney	Plant Operator, City of North Battleford	September 20, 2001 October 9, 2001 October 10, 2001
Mark Getzlaf	Manager, Environmental Protection Section, Parkland EcoRegion, Saskatchewan Environment and Resource Management	November 13, 2001 November 14, 2001
Rick Hanson	Water Treatment Manager, City of Prince Albert	December 5, 2001
Frank Hollman	Plant Operator, City of North Battleford	October 10, 2001 October 11, 2001
Dr. Gregory Horsman	Medical Director, Laboratory and Disease Control Services Branch, Saskatchewan Health	October 19, 2001
Ivan Katzell	Plants Foreman, City of North Battleford (January 1981 to December 2000)	November 5, 2001 November 6, 2001 November 7, 2001 November 8, 2001
Richard Koroluk	Senior Public Health Inspector, Battlefords Health District	November 5, 2001
Jean Leitner	Communicable Disease Control Coordinator, Battlefords Health District	October 19, 2001
Dr. Geoffery Lipsett	Family Physician, North Battleford	October 17, 2001
Rodger McDonald	MR2 McDonald & Associates Consultant, City of North Battleford	September 17, 2001 September 18, 2001 September 19, 2001 November 27, 2001
Douglas McEwen	City Commissioner, City of North Battleford (May 1986 to December 1999)	November 28, 2001 November 29, 2001

Scott Meekma	Environmental Protection Officer, Parkland EcoRegion, Saskatchewan Environment and Resource Management	November 8, 2001 November 9, 2001
Thon Phommavong	Senior Standards Analyst/Engineer, Environmental Protection Branch, Saskatchewan Environment and Resource Management	December 3, 2001 December 4, 2001
Roger Piatt	Public Health Inspector, Battlefords Health District	November 5, 2001
Wayne Ray	Mayor, City of North Battleford	November 29, 2001 November 30, 2001
Robert Ruggles	Assistant Deputy Minister, Programs Division, Saskatchewan Environment and Resource Management	December 3, 2001 December 4, 2001
Dr. Stephen J. Stanley	General Manager, Operations, EPCOR Water Services Inc.	September 19, 2001 September 20, 2001 November 27, 2001 November 28, 2001
Kenneth Startup	Public Health Inspector, Battlefords Health District	October 17, 2001
Randall Strelioff	Director, Public Works, City of North Battleford	November 15, 2001 November 16, 2001 November 26, 2001
Judy Szuch	Engineering Technologist, City of North Battleford	October 12, 2001
Peter Thiele	Client Services Consultant, Environmental Protection Branch, Saskatchewan Environment and Resource Management	November 14, 2001 November 15, 2001
Dr. Thomas Thompson	Manager, Laboratory and Disease Control Services Branch, Saskatchewan Health	October 19, 2001

James Toye	City Commissioner, City of North Battleford	November 29, 2001
Dr. Eric Young	Deputy Chief Medical Health Officer Saskatchewan Health	October 18, 2001

Appendix P - Briefs Received

NORTH BATTLEFORD
WATER INQUIRY

Justice Robert D. Laing
Commissioner

Briefs Received

Gabor, T.S., Murkin, H.R., Curry, P., Hill, M., Chekay, D. and Annand, M. December, 2001. *"Beyond the Pipe" The Importance of Wetlands and Upland Conservation Practices in Watershed Management: Functions and Values for Water Quality and Quantity.* Ducks Unlimited Canada.

Bowden, M.A., Ross, S.E. November 20, 2001. *The Legal Regime for Water Management in Saskatchewan.*

Christensen, R.L., Christie, E. *A Paper On The Regulatory Approaches To Drinking Water Used In Canada And, Selectively, Abroad.* Prepared for the public inquiry into the E.Coli contamination of the water supply in Walkerton, Ontario, and into the safety of Ontario's drinking water. Sierra Legal Defence Fund.

Christensen, R.L. January, 2001. *Waterproof: Canada's Drinking Water Report Card.* Sierra Legal Defence Fund.

Appendix Q - Undertaking of Counsel

NORTH BATTLEFORD
WATER INQUIRY

UNDERTAKING OF COUNSEL
TO THE COMMISSION OF THE NORTH BATTLEFORD INQUIRY

I undertake to the Commission of the North Battleford Inquiry that any and all documents or information which are produced to me in connection with the Commission's proceedings will not be used by me for any purpose other than those proceedings. I further undertake that I will not disclose any such documents or information to anyone for whom I do not act, and to anyone for whom I act only upon the individual in question giving the written undertaking annexed hereto. In the event I act for a coalition, I will disclose such documents and information to anyone who is a member of that coalition only upon that individual in question giving the written undertaking annexed hereto.

I understand that this undertaking has no force or effect once any such document or information has become part of the public proceedings of the Commission, or to the extent that the Commissioner may release me from the undertaking with respect to any document or information. For greater certainty, a document is only part of the public proceedings once the document is made an exhibit at the Inquiry.

With respect to those documents or information which remain subject to this undertaking at the end of the Inquiry, I undertake to either destroy those documents or information, and provide a certificate of destruction to the Commission, or to return those documents to the Commission for destruction. I further undertake to collect for destruction such documents or information from anyone to whom I have disclosed any documents or information which were produced to me in connection with the Commission's proceedings.

____________________ Signature	____________________ Witness
____________________ Date	____________________ Date

Appendix R - Supplementary Undertaking of Counsel

SUPPLEMENTARY UNDERTAKING OF COUNSEL TO THE COMMISSION OF THE NORTH BATTLEFORD INQUIRY WITH RESPECT TO EXPERTS

I undertake to the Commission of the North Battleford Inquiry that any and all documents or information which are produced to me in connection with the Commission's proceedings will not be used by me for any purpose other than those proceedings. I further undertake that I will not disclose any such documents or information to anyone for whom I do not act or who has not been retained as an expert for the purposes of the Inquiry. In respect of anyone for whom I act or any expert retained for the purposes of the Inquiry, I further undertake that I will disclose any such documents or information only upon the individual in question giving the appropriate written undertaking annexed hereto. In the event that I act for a coalition, I will disclose such documents and information to anyone who is a member of that coalition only upon the individual in question giving the written undertaking annexed hereto.

I understand that this undertaking has no force or effect once any such document or information has become part of the public proceedings of the Commission, or to the extent that the Commissioner may release me from the undertaking with respect to any document or information. For greater certainty, a document is only part of the public proceedings once the document is made an exhibit at the Inquiry.

With respect to those documents or information which remain subject to this undertaking at the end of the Inquiry, I undertake to either destroy those documents or information, and provide a certificate of destruction to the Commission, or return those documents to the Commission for destruction. I further undertake to collect for destruction such documents or information from anyone to whom I have disclosed any documents or information which were produced to me in connection with the Commission's proceedings.

Signature	Witness
Date	Date

Appendix S - Undertaking of Counsel Regarding Documents

NORTH BATTLEFORD
WATER INQUIRY

[illegible]

UNDERTAKING OF COUNSEL
TO THE COMMISSION OF THE NORTH BATTLEFORD INQUIRY

I undertake to the Commission of the North Battleford Inquiry that any and all documents or information which are produced to me in connection with the Commission's proceedings will not be used by me for any purpose other than those proceedings. I further undertake that I will not disclose any such documents or information to anyone for whom I do not act, and to anyone for whom I act only upon the individual in question giving the written undertaking annexed hereto. In the event I act for a coalition, I will disclose such documents and information to anyone who is a member of that coalition only upon that individual in question giving the written undertaking annexed hereto.

I understand that this undertaking has no force or effect once any such document or information has become part of the public proceedings of the Commission, or to the extent that the Commissioner may release me from the undertaking with respect to any document or information. For greater certainty, a document is only part of the public proceedings once the document is made an exhibit at the Inquiry.

With respect to those documents or information which remain subject to this undertaking at the end of the Inquiry, I undertake to either destroy those documents or information, and provide a certificate of destruction to the Commission, or to return those documents to the Commission for destruction. I further undertake to collect for destruction such documents or information from anyone to whom I have disclosed any documents or information which were produced to me in connection with the Commission's proceedings.

Signature

Witness

Date

Date

Appendix T - Certification of Production of Documents

NORTH BATTLEFORD
WATER INQUIRY

Justice Robert D. Laing
Commissioner

CERTIFICATION OF PRODUCTION OF DOCUMENTS

To: The North Battleford Water Inquiry (The Commission)

I .... *(full name of person)*, of the

....(City, Town, *etc.*) of

.... in the Province of

...., a .... (Position)

of the ....(Client Name)

CERTIFY:

1. I have directed staff and employees of the ________________ to conduct a diligent search of the paper-based and electronically-maintained documents in the possession, control or power of the __________________ and have made the necessary enquires of others to inform myself in order to make this Certification.

2. To my knowledge, information and belief, all such documents relating to any issue relevant to the Commission, including specifically those referred to in the document requests of the Commission, that are in the possession, control or power of the _________________ have been produced to the Commission.

3. If at anytime I learn that the Certification was based on incorrect erroneous information, I shall contact the Commission forthwith with such new information.

Date...   ....

(Signature)

Appendix U - Evidence Agreement

NORTH BATTLEFORD
WATER INQUIRY

Justice Robert D. Laing
Commissioner

IN THE MATTER OF THE PUBLIC INQUIRIES ACT R.S.S.1978c.P-38

AND IN THE MATTER OF THE COMMISSION OF INQUIRY INTO THE SAFETY OF PUBLIC DRINKING WATER IN THE CITY OF NORTH BATTLEFORD, SASKATCHEWAN PURSUANT TO ORDER IN COUNCIL 357/2001
DATED 10 MAY, 2001

AGREEMENT

Commission Counsel and counsel for those parties having standing in the Inquiry pursuant to the Order of the Honorable Mr. Justice Robert D. Laing, dated 29 June, 2001, hereby agree that all Documents disclosed by Commission Counsel are admissible, as full exhibits and are proven, in the absence of proof to the contrary, without the requirement of formal proof, for the purposes of the Inquiry:

1. As to authenticity;
2. As to execution;
3. In the case of correspondence and/or facsimile transmissions, as to sending by the author and receipt by the address with enclosures within reasonable times after the date of any such document; and
4. In the case of photocopies that they are accurate reproductions of the original and are admissible in the place of the original documents;

but, the said documents being admissible as full exhibits and proven does not make them binding with respect to veracity, weight or effect which shall depend upon the evidence received.

Dated this day of September _____, 2001

Commission Counsel

Per: ______________________________

City of North Battleford

Per: ______________________________

Battlefords District Health Board

Per: ______________________________

Government of Saskatchewan

Per: ______________________________

Saskatchewan Environmental Society Nature Saskatchewan

Per: ______________________________

Dr. Benade, Dr. Butler-Jones and Dr. Young

Per: ______________________________

Canadian Union of Public Employees, Local 287

Per: ______________________________

Association of Professional Engineers and Geoscientists of Sask.

Per: ______________________________

Citizens Group

Per: ______________________________

Appendix V - Ruling on Final Submissions

[illegible]

[illegible]

RULING ON FINAL SUBMISSIONS

A number of issues have been raised by counsel with respect to final submissions to the Inquiry which are addressed in the following:

(1) Final submissions to the Commission are scheduled for January 14 and 15, 2001. It is decided that:

(a) Each party shall submit its written brief to the Commission by the close of business on Wednesday, January 9, 2002 in **ten** copies in order that the Commission may forward to all other parties a copy of such submission to be received no later than Friday, January 11, 2002.

(b) The North Battleford Citizens Group, The Government of Saskatchewan, and The City of North Battleford, shall each have up to two hours for oral submission to supplement any written submissions, and these groups will be the last three groups to address the Commission in the foregoing order.

(c) All other parties shall have up to one hour for oral submissions, and shall make such submissions in the following order:

(i) the Association of Professional Engineers and Geoscientists of Saskatchewan;

(ii) Saskatchewan Environmental Society and Nature Saskatchewan;

(iii) The Battlefords District Health Board.

(iv) Dr. Benadé, Dr. Butler-Jones and Dr. Eric Young;

(v) CUPE, Local 287.

(d) Each party will be allowed up to a 15-minute reply at the conclusion of all oral submissions to address matters that have been raised by other parties which affect that party.

(e) Submissions will commence at 10:00 a.m. on January 14, 2002 and at 9:00 a.m. on January 15, 2002.

(2) With respect to those parties granted funding for the Inquiry, up to 20 hours preparation time will be allowed to prepare for final submissions.

DATED at the City of Saskatoon, in the Province of Saskatchewan, this 14th day of December 2001.

Justice Robert D. Laing
COMMISSIONER